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CURRENT WORLD PREVALENCE OF DISEASE

A REVIEW OF THE MONTHLY EPIDEMIOLOGICAL REPORT ISSUED OCTOBER 15, 1926, BY THE HEALTH SECTION OF THE LEAGUE OF NATIONS' SECRETARIAT[1]

Only five of the ports in the Far East, which report to the Singapore Bureau, reported either cases of cholera or deaths from this disease during the two weeks ending October 9, and in nearly all localities in eastern Asia, where cholera was prevalent during the past summer, there was marked improvement in the situation at the end of August or during September according to the data made available in the October Epidemiological Report published by the Health Section of the League of Nations. The table below gives the reports from port towns for the five weeks ending October 9.

TABLE 1.—*Cholera cases reported in the principal maritime towns of the Far East between September 5 and October 9, 1926*

Towns	Weeks ending—				
	September			October	
	11	18	25	2	9
Deaths:					
Calcutta	18	9	7	------	14
Madras	0	1	3	0	0
Negapatam	1	3	0	0	0
Cases:					
Bangkok	7	2	3	0	2
Amoy	53	50	42	23	18
Shanghai	57	66	31	22	6
Antung	0	0	0	2	0
Dairen	3	1	1	0	0
Harbin	27	------	0	0	0

At Shanghai and Amoy a marked diminution in the number of new cases of cholera was shown by the reports for the two weeks ending October 9, and the outbreaks at Harbin and Dairen apparently had come to an end. In southern China, at Hoihow, Hainan, the number of deaths from cholera declined from 410 in the four weeks ending August 1 to 116 in the five weeks ending September 5. Cholera was reported also from Swatow and other parts of the island of Hainan. At Kwang-Chow-Wan, where 483 cholera cases were reported in August, 194 cases were reported from September 1 to 20.

[1] From the Office of Statistical Investigations.

"Cholera remained prevalent in Tonkin and Annam in September but disappeared from the remainder of French Indo-China except for a few sporadic cases," says the Report. Cases reported in each Province from June to September are shown in the table below.

TABLE 2.—*Cholera cases reported in French Indo-China, June–September, 1926*

Month	Cambodia	Cochin-China	Laos	Annam	Tonkin
June	521	1,159	0	128	724
July	362	403	7	212	784
August	120	39	32	297	234
September	4	5	0	138	200

The incidence of cholera in Siam has been declining since last May when 2,660 cases were reported. During the four weeks ending September 11, 204 cases were reported as against 674 cases in the previous four weeks.

Plague.—Three cases of plague were reported at Constantinople during September and none in other Mediterranean ports during the month. Twelve cases occurred in the western desert district of Egypt at Sidi-Barrani between August 19 and September 4, but no cases were reported from any part of Egypt during the remainder of September.

At Beirut, Syria, there were 2 cases of plague on October 11 and another on October 12.

A marked decrease in plague occurred in Senegal during August when only 37 new cases were notified as against 178 in July and 192 in June, the peak month of the outbreak.

In Madagascar the number of cases showed an increase during August, and more cases were reported than in August of any previous year. "The disease is, as usual, most prevalent in the Province of Tananarive," states the Report, "but is spreading also elsewhere and especially at Majunga, where 42 cases were reported during the first half of September. Pulmonary and septicemic cases were very common, as is seen from the table below."

TABLE 3.—*Plague cases reported in Madagascar, showing type of disease, July 16 to September 15, 1926*

Date	Bubonic	Pulmonary	Septicemic	Total
July 16-31	2	5	0	7
Aug. 1-15	21	7	2	30
Aug. 16-31	42	32	38	112
Sept. 1-15	58	17	12	87

"In India plague was spreading during August in Lower Burma and in the Central Provinces and Berar. Outside of these two areas only a few plague cases were reported. In the ports plague cases were reported in September at Rangoon and at Bombay."

No case of plague was reported in August or September at Kwang-Chow-Wan, where 52 cases occurred in June and July. In French Indo-China there were 3 plague cases in September as against 11 in August. Siam reported 6 plague cases in August and only 1 in July.

Plague incidence in Java during the past summer reached the lowest level since 1919. The table below shows that the improvement was general throughout the island with the exception of the Province of Pekalongan, where plague was not very prevalent in 1925. In Surakarta, which was the worst infected Province, a remarkable decline is shown.

TABLE 4.—*Plague deaths reported in Java between June 21 and August 14, 1925 and 1926*

Provinces	1925	1926
Bantam, Batavia, and Preanger	0	0
Cheribon	122	42
Pekalongan	94	150
Semarang	39	1
Banjumas	182	32
Kedu	167	55
Djokjakarta	13	36
Surakarta	631	38
East Java and Madura	8	1
Total	1,256	355

Twenty-one plague cases were reported in Peru in August, nearly all in the Department of Lima. Seven cases were reported at Guayaquil, Ecuador, in the same month. Argentina reported 3 cases in the first week of October, all in inland localities of the Provinces of Cordoba and Chubut.

Yellow fever.—Cases of yellow fever reported were as follows:

TABLE 5.—*Yellow fever*

Localities	Date	Cases	Deaths
Africa:			
Dahomey—			
Porto-Novo	Sept. 10	2	1
Gold Coast	July 1-31	8	3
Nigeria	do	4	3
America:			
Brazil—[1]			
Bahia	May 23-29	1	1
	June 6-19	4	3
	June 20-26	2	1
	July 4-10	1	

[1] Public Health Reports.

In the Gold Coast 17 cases had been reported from March to July, more than during either of the previous two years, when 6 and 8 cases were reported in 1924 and 1925, respectively.

Typhus and relapsing fever.—Typhus reaches its minimum seasonal incidence in Europe in the late summer, and the disease was little in evidence during August and September. A slight recrudescence

in Poland occurred in September, when 55 cases were reported during the two weeks ending September 18 as against 15 in the previous two weeks.

In Korea, where 118 cases of typhus were reported in June, the incidence declined markedly and only 37 cases were reported in July. No cases have been reported in Japan since May.

Typhus has shown a declining incidence in Chile since 1920, and its decline was accelerated during the first half of 1926, when 83 cases were reported, compared with 317 during the corresponding period of 1925.

An outbreak of relapsing fever occurred in Nigeria in June and July and 324 cases with 41 deaths were reported.

Smallpox.—"Smallpox is becoming increasingly rare on the European Continent," says the Report, but "A new increase of smallpox began early in September in England; 443 cases were reported during the four weeks ended October 2, as against 305 cases during the previous four weeks and 119 during the corresponding period last year. The great majority of cases occur, as usual, in northern England, but there have been a few cases also in London and in Middlesex. There was 1 death from smallpox at South Shields and 1 in the suburbs of London during the week ended October 2."

Dysentery.—The usual seasonal rise in the incidence of dysentery occurred in August or September in most of the central European countries. In Germany 887 cases were reported in the four weeks ending September 18 as against 565 in the previous four weeks, but the incidence was no higher than in either of the previous two years. Czechoslovakia reported 206 cases, Hungary 426 cases, and the Kingdom of the Serbs, Croats, and Slovenes 236 cases in August. In Poland 1,310 cases were reported during the four weeks ended September 18, an increase over the 849 cases in the corresponding period of 1925, but not much more than 50 per cent of the 2,303 cases reported in the corresponding weeks of 1924.

In Japan dysentery shows the same seasonal variation common in Europe, and this year the disease has been more prevalent than it was in 1925. In Java bacillary dysentery was reported to be very prevalent in the first quarter of the year, but the incidence subsided during the spring. There were a number of local outbreaks in scattered districts of the island and no general epidemic.

TABLE 6.—*Dysentery cases reported in Japan and Java by four-weekly periods, 1924, 1925, and 1926*

Four weeks ending—	Japan			Java[1]		
	1924	1925	1926	1924	1925	1926
Jan. 31	[2] 153	139	174	1,554	347	1,153
Feb. 28	[2] 161	116	180	1,136	110	3,000
Mar. 28	[2] 192	183	202	493	40	2,733
Apr. 25	[2] 265	214	254	218	21	1,215
May 23	[2] 577	289	472	159	62	396
June 20	[3] 676	678	895	180	41	519
July 18	2,179	1,947	1,859	134	24	243
Aug. 15	3,021	2,953	3,210	64	12	118
Sept. 12	4,013	2,560	3,550	36	60	-------
Oct. 10	3,041	2,297	-------	33	162	-------
Nov. 7	1,477	1,061	-------	108	163	-------
Dec. 4	491	550	-------	122	251	-------
Jan. 2	243	302	-------	355	646	-------

[1] Bacillary dysentery only. [2] Data for calendar months. [3] Data for period June 1–20.

Enteric fever.—The report states: "The incidence of enteric fever in European countries in August did not on the whole differ greatly from last year. The situation was more favorable than in August, 1925, in Denmark, Norway, Great Britain, and the Balkan countries. More cases were reported in Poland in August and September than during the corresponding months of 1925. A sudden and severe outbreak of enteric fever occurred in September at Hanover, in Germany, where over 2,000 cases were reported in three weeks. During the two weeks ended September 25, 111 deaths were attributed to enteric fever in the city of Hanover alone. During the week ended August 28 also, 100 cases of 'meat poisoning' were reported at Hanover. The Deutsche Medizinische Wochenschrift states that during that week numerous cases of infectious enteritis occurred at Hanover and were ascribed to the unusually high bacterial content of the drinking water. The bacilli disappeared after chlorination of the water."

In Palestine 421 cases of enteric fever were reported during June and July, compared with 147 cases during the corresponding two months of 1925.

In the United States the incidence was slightly lower than last year. During the four weeks ended September 4, 38 States reported 4,849 cases.

Influenza.—In Mauritius 910 influenza cases and 35 deaths were reported in June; the seasonal maximum is usually in July. Mild outbreaks were reported in July in Basutoland and southern Rhodesia.

New Zealand reported an outbreak of influenza which started in June and reached its maximum in July. During the 12 weeks ending September 6, 117 deaths were attributed to influenza as against 7 during the corresponding period last year.

Acute poliomyelitis.—"An unusual prevalence of poliomyelitis was reported in England and Wales, where more cases were notified in August and September than during the corresponding months of any of the previous eight years," says the Report. The highest number of cases was reported in the county of Leicester, where there were 102 cases during the eight weeks ending October 9, and in Essex, where there were 52 cases in the same period.

An extensive outbreak also occurred in Germany, where it seems to have reached its maximum in the first weeks of September. The cases were scattered throughout northern Germany, while Bavaria, Wurtemberg, and Baden were practically free from the disease.

TABLE 7.—*Cases of poliomyelitis notified in England and Wales and in Germany in 1925 and 1926*

Four weeks ending—	England and Wales		Germany	
	1925	1926	1925	1926
Jan. 31	26	17	17	22
Feb. 28	23	20	28	14
Mar. 28	17	14	21	18
Apr. 25	12	14	18	18
May 23	16	17	25	22
June 20	15	23	18	21
July 18	17	26	20	57
Aug. 15	28	98	31	160
Sept. 12	61	181	57	454
Oct. 10	57	227	53	
Nov. 7	44		45	
Dec. 5	28		37	

Poliomyelitis was much less prevalent in August in the United States than during the previous two years. The disease was also less prevalent in the Scandinavian countries.

Scarlet fever.—Scarlet-fever cases increased in Germany, the Netherlands, and especially in Poland during August and September, and in all three countries the incidence is higher than last year.

TABLE 8.—*Scarlet-fever cases reported in Poland, Germany, and the Netherlands, July 18–October 9, 1925 and 1926*

3 weeks ending—	Poland		Germany		Netherlands	
	1925	1926	1925	1926	1925	1926
Aug. 7	1,151	1,813	1,900	2,182	567	711
Aug. 28	1,200	2,388	2,167	2,812	673	704
Sept. 18	1,511	3,752	2,535	3,756	744	873
Oct. 9	1,798		2,965		1,040	1,211

In Poland scarlet fever was reported to be most prevalent in the populous centers and the highest incidence to be among the Jewish population. At Warsaw 14,000 children had been vaccinated against scarlet fever and only 2 cases out of 410 cases reported occurred among those previously vaccinated.

In Germany the disease is most prevalent in east Prussia, Brandenburg, Silesia, Saxony, and the Rhineland; least prevalent in Bavaria and Wurttemberg.

Diphtheria.—The incidence of diphtheria in Europe, on the whole, was slightly lower in August and the first half of September than it was last year. A slight increase over last year, however, was indicated in the reports for Poland, Hungary, Kingdom of the Serbs, Croats, and Slovenes, and Bulgaria.

In the United States about the same number of diphtheria cases were reported early in September as at the corresponding date last year.

Tuberculosis.—The mortality from tuberculosis in a number of large towns during the first half of 1926 is compared with the corresponding rates for 1925 in the following table. While the mortality from tuberculosis is usually higher in the first half year than in the second half year, and these rates, therefore, are not representative of the annual rate, they show, nevertheless, that the decline in tuberculosis mortality has continued in nearly all the towns.

TABLE 9.—*Mortality from tuberculosis in various cities during the first half year of 1925 and 1926*

Cities	Population in thousands	1925		1926		Increase or decrease
		Deaths	Rates per 100,000	Deaths	Rates per 100,000	
(a) Tuberculosis, all forms						
Europe:						*Per cent*
Lille	201	299	298	227	226	−24.2
Breslau	555	386	139	308	111	−20.1
Dresden	619	418	135	341	110	−18.5
Lyons	562	813	289	669	238	−17.6
Budapest	961	1,631	340	1,378	287	−15.6
Dublin	438	471	215	398	182	−15.3
Tallinn	127	198	312	170	268	−14.1
Berlin	4,014	2,559	128	2,221	111	−13.3
Munich	681	439	129	382	112	−13.2
Edinburgh	427	326	153	285	133	−13.1
Hamburg	1,079	703	130	611	113	−13.1
Oslo	258	230	178	204	158	−11.2
Glasgow	1,057	796	151	720	136	−9.9
Venice	201	234	233	211	210	−9.9
London	4,602	2,652	115	2,399	104	−9.6
Cologne	727	483	133	439	121	−9.0
Prague	713	690	194	642	180	−7.2
The Hague	398	177	89	170	85	−4.5
Rotterdam	552	330	120	316	115	−4.2
Stockholm	439	360	164	348	159	−3.0
Trieste	249	380	305	368	296	−3.0
Genoa	335	389	232	381	227	−2.6
Paris	2,906	4,488	309	4,373	301	−2.6
Thirty Swiss cities [1]	1,176	812	139	804	137	−1.4
Copenhagen	587	354	121	352	120	−0.8
Madrid	783	1,113	284	1,149	293	+3.1
Belfast	415	433	209	472	227	+8.6
Milan	857	685	160	747	174	+8.8
Bologna	221	192	174	217	196	+12.6
Amsterdam	718	352	98	399	111	+13.2
Cracow	187	230	246	285	304	+23.6

[1] In 1925, 26 cities only.

TABLE 9.—*Mortality from tuberculosis in various cities during the first half year of 1925 and 1926*—Continued

Cities	Population in thousands	1925		1926		Increase or decrease
		Deaths	Rates per 100,000	Deaths	Rates per 100,000	
(a) Tuberculosis, all forms—Continued						
America:						*Per cent*
San Francisco	558	323	116	303	109	−6.0
Sao Paulo	850	444	104	422	99	−4.8
St. Louis	822	312	76	244	59	−2.2
New Orleans	414	400	193	405	196	+1.6
Boston	780	424	109	433	111	+1.8
Chicago	2,995	1,350	90	1,398	93	+3.3
Asia: Manila	308	795	516	833	541	+4.8
(b) Pulmonary tuberculosis						
Europe: Sofia	154	366	475	444	577	+21.5
America:						
Montevideo	423	780	369	567	268	−27.4
New York	6,252	2,683	86	2,700	86	0
Asia:						
Madras [2]	527	653	307	625	294	−4.2
Singapore	396	615	311	663	335	+7.7
Bombay [2]	1,176	516	104	590	118	+13.5

[2] Twenty-two weeks only.

Trachoma.—Information on the prevalence of trachoma is shown in the table below:

TABLE 10.—*Trachoma cases reported in various countries, 1924–1926*

Country	Total, 1924	1925				1926	
		First quarter	Second quarter	Third quarter	Fourth quarter	First quarter	Second quarter
Germany	1,784	487	757	619	914	575	684
Austria	341	175	255	104	293	414	172
Danzig	54	9	11	17	12	11	9
Estonia	528	168	142	76	85	91	81
France	[1] 73	8	29	11	6	12	9
Lithuania	2,375	571	531	372	644	[2] 65	146
Malta	----------	89	71	123	250	107	184
Poland	2,954	1,012	1,057	962	1,720	1,400	2,094
Switzerland	13	2	12	1	1	5	4
Czechoslovakia	2,782	651	1,001	760	823	810	1,354
Saar Territory	3	4	0	1	10	4	0
U. S. S. R.:							
Governments and territories in Europe	362,890	139,401	166,602	149,045	105,057	78,210	----------
Ukraine	49,592	18,022	17,160	15,874	19,160	23,660	[3] 16,009
Transcaucasia	45,982	4,474	11,326	15,603	14,579	280	----------
Siberia	48,158	10,627	10,486	12,216	----------	1,561	----------
Kirghiz Republic	12,045	21,143				1,037	----------
Turkestan	6,648	23,181				----------	----------
Waterways, railways	648	986	994	614	842	1,590	----------
Tunisia	102	24	1	0	0	1	0
United States	3,260	392	487	444	628	316	734
New Zealand	20	10	5	4	10	3	5

[1] Compulsorily notifiable from Apr. 1, 1926.
[2] Month of March only.
[3] Data for April and May only.

SYNTHESIS AND INDICATOR PROPERTIES OF SOME NEW SULFONPHTHALEINS

By Barnett Cohen, Chemist, Hygienic Laboratory, United States Public Health Service

Sensitiveness, brilliant color, and general stability place the simpler sulfonphthaleins in the front rank of acid-base indicators. Although a few of these compounds have been known for some time, a fuller realization and utilization of their unique properties as indicators did not appear until Lubs and Clark (1915, 1916) reported some new syntheses, and Clark and Lubs (1916) proposed their selection of indicators for the determination of hydrions. Not only was a useful set of indicators presented by these authors but, as will be shown presently, there was implicit in their data the means for extending and modifying the series almost at pleasure. Indeed, given the requisite skill in organic synthesis, it would be no great exaggeration to claim the possibility of producing a sulfonphthalein of any desired apparent dissociation constant (useful indicator range) and of almost any color characteristics, within limitations.

The writer's attention was drawn to the problem specifically by the need for a sulfonphthalein substitute for methyl red (an azo compound) in the Clark and Lubs series. Hydrion color standards containing methyl red are notoriously unstable, and the indicator becomes unreliable when used in a biologically active medium, owing, presumably, to more or less reversible reduction and to decompositions. By comparison, the sulfonphthaleins as a class are much more stable. Hence the development of a sulfonphthalein substitute for methyl red would serve two useful purposes—(1) eliminate the unreliable methyl red and (2) render the Clark and Lubs series more uniform chemically.

Analysis of the data of Clark and Lubs led to the decision that di-halogenation of a meta-methyl phenol should produce the desired substitute, and experimental test resulting in the synthesis of tetrabrom-m-cresol sulfonphthalein (brom cresol green) verified this conclusion. Incidentally, a number of other compounds were prepared; and six of them appeared of sufficient value as indicators to merit further study and introduction into the Clark and Lubs series.[1]

The following report includes a description of the synthesis of the new sulfonphthaleins and of their absorption curves in the visible spectrum. The apparent dissociation constants were also determined, and data are presented on the salt and protein errors.

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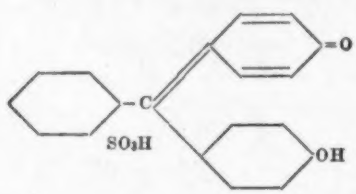
[1] A preliminary report on five of these compounds was made in 1923: Public Health Reports, 38, 199. Circumstances have prevented a more detailed report until now, but in the meantime the essential details for the synthesis of these compounds were made available to all inquirers.

EFFECTS OF SIMPLE SUBSTITUTIONS IN PHENOLSULFONPHTHALEIN UPON IONIZATIONS

Structurally phenolsulfonphthalein is a triphenylmethane derivative containing a sulfophenyl and two phenol radicals, the latter attached in their para positions to the methane carbon.

Rather little is known of the effects of substitution in the sulfophenyl radical upon dissociations in the compound (cf. Lubs and Acree, 1916). The dissociation in the strong sulfonic acid radical occurs in the extreme acid ranges, and theoretical considerations suggest that pronounced changes in the constant of this dissociation should be produced by substitutions in the sulfobenzoic acid nucleus. Consequently, should the need arise for the development of sulfonphthalein indicators for extremely acid regions, this type of substitution would be likely to yield compounds of the required indicator properties.

Although accurate comparative measurements of dissociation constants of the sulfonic acid in the different known sulfonphthaleins are not available, we do know that alkyl substitution in the position meta to the phenolic hydroxyl (such as is found in thymol sulfon-



phthalein and m-cresol sulfonphthalein) suppresses this dissociation greatly, enough at least to enable the employment of these compounds as indicators in the pH region between 1.0 and 3.0.

More useful and definite data are available as to the effects of substitution in the phenolic radicals upon the dissociation of the phenolic hydrion, although many gaps still remain to be filled in. It is this dissociation which determines the zones of color-change of most of the useful sulfonphthalein indicators. Such information as is available will be found in Table 1. The value of the dissociation constant K_a is expressed in terms of pK_a, which equals $\log \frac{1}{K_a}$. The names in parentheses are the common laboratory names proposed for the unwieldy ones of the more common compounds.

TABLE 1.—*Apparent dissociation constant of the phenolic hydrion in the sulfonphthaleins*

Substituted phenol	pK_a
2-isopropyl-5-methyl phenol (thymol blue)	8.90
2, 3-dimethyl phenol (xylenol blue)	8.9?
*2, 6-dimethyl phenol	8.6
*3-methyl phenol (m-cresol purple)	8.32

Substituted phenol	pK$_a$
2-methyl phenol (o-cresol red)	8. 20
phenol (phenol red)	7. 90
o-iodophenol	6. 6
*o-bromophenol (brom phenol red)	6. 16
*o-chlorophenol (chlor phenol red)	5. 98
2, 6-dibromophenol (brom phenol blue)	4. 05
*2-bromo-6-chlorophenol (brom-chlor phenol blue)	3. 98
*2, 6-dichlorophenol	4. 0?
2, 6-dinitrophenol	3. 3?
6-bromothymol (brom thymol blue)	7. 10
6-bromo-2, 3-xylenol	7. 1?
6-bromo-2-methyl phenol (brom cresol purple)	6. 30
*2, 6-dichloro-3-methyl phenol (chlor cresol green)	4. 8
*2, 6-dibromo-3-methyl phenol (brom cresol green)	4. 67

The compounds marked with an asterisk were synthesized by the author, and, with the exception of the 2, 6-dichlorophenol derivative (tetrachloro-phenolsulfonphthalein) were of sufficient purity to give well-defined dissociation constants. The sample of di-iodo-phenolsulfonphthalein (o-iodophenol derivative) was obtained from the National Aniline & Chemical Co. The data for the other compounds were obtained from Brode (1924), Clark, Cohen, and Elvove (1922), and A. Cohen (1922, 1923).

A mere inspection of this table discloses the following important facts: Alkyl groups depress the dissociation of the phenolic hydrogen and halogens increase it. Considering the effects of alkyl substitution more in detail, it will be noted that meta-substitution has a greater effect than ortho-substitution, that di-substitution has a greater effect than mono-substitution, and that a combination of ortho plus meta-substitution is more effective than di-ortho substitution. The data are not extensive enough to disclose the effect of the heavier isopropyl group as compared with the methyl.

Mono-halogenation in the ortho position increases the ionization of the phenolic hydrogen in the order, iodo < bromo < chloro. Attempts to prepare meta-halogen sulfonphthaleins have been unfruitful, but should the synthesis be accomplished, it will probably be found that the effect on ionization is rather less than that of ortho-halogenation. In terms of pK$_a$ differences, di-halogenation has twice the effect of mono-halogenation. This mode of designating the effects on ionizations is very useful, but the reader should keep in mind that the pK$_a$ differences are direct functions of differences between the *energies* of ionizations and not between the *magnitudes* of the dissociation constants.

Rather noteworthy is an apparent reversal in the order of effect upon ionization of the phenolic hydrion by chlorine and bromine in di-ortho halogenation on the one hand and tetra-ortho halogenation on the other. In phenolsulfonphthalein, dichlorination produces a

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Jan. 31	[2] 153	139	174	1,554	347	1,153
Feb. 28	[2] 161	116	180	1,136	110	3,000
Mar. 28	[2] 192	183	202	493	40	2,733
Apr. 25	[2] 265	214	254	218	21	1,215
May 23	[2] 577	289	472	159	62	396
June 20	[3] 676	678	895	180	41	519
July 18	2,179	1,947	1,850	134	24	243
Aug. 15	3,021	2,953	3,210	64	12	118
Sept. 12	4,013	2,560	3,550	36	60	--------
Oct. 10	3,041	2,297	--------	33	162	--------
Nov. 7	1,477	1,061	--------	108	163	--------
Dec. 4	491	550	--------	122	251	--------
Jan. 2	243	302	--------	355	646	--------

[1] Bacillary dysentery only. [2] Data for calendar months. [3] Data for period June 1–20.

Enteric fever.—The report states: "The incidence of enteric fever in European countries in August did not on the whole differ greatly from last year. The situation was more favorable than in August, 1925, in Denmark, Norway, Great Britain, and the Balkan countries. More cases were reported in Poland in August and September than during the corresponding months of 1925. A sudden and severe outbreak of enteric fever occurred in September at Hanover, in Germany, where over 2,000 cases were reported in three weeks. During the two weeks ended September 25, 111 deaths were attributed to enteric fever in the city of Hanover alone. During the week ended August 28 also, 100 cases of 'meat poisoning' were reported at Hanover. The Deutsche Medizinische Wochenschrift states that during that week numerous cases of infectious enteritis occurred at Hanover and were ascribed to the unusually high bacterial content of the drinking water. The bacilli disappeared after chlorination of the water."

In Palestine 421 cases of enteric fever were reported during June and July, compared with 147 cases during the corresponding two months of 1925.

In the United States the incidence was slightly lower than last year. During the four weeks ended September 4, 38 States reported 4,849 cases.

Influenza.—In Mauritius 910 influenza cases and 35 deaths were reported in June; the seasonal maximum is usually in July. Mild outbreaks were reported in July in Basutoland and southern Rhodesia.

New Zealand reported an outbreak of influenza which started in June and reached its maximum in July. During the 12 weeks ending September 6, 117 deaths were attributed to influenza as against 7 during the corresponding period last year.

Acute poliomyelitis.—"An unusual prevalence of poliomyelitis was reported in England and Wales, where more cases were notified in August and September than during the corresponding months of any of the previous eight years," says the Report. The highest number of cases was reported in the county of Leicester, where there were 102 cases during the eight weeks ending October 9, and in Essex, where there were 52 cases in the same period.

An extensive outbreak also occurred in Germany, where it seems to have reached its maximum in the first weeks of September. The cases were scattered throughout northern Germany, while Bavaria, Wurtemberg, and Baden were practically free from the disease.

TABLE 7.—*Cases of poliomyelitis notified in England and Wales and in Germany in 1925 and 1926*

Four weeks ending—	England and Wales		Germany	
	1925	1926	1925	1926
Jan. 31	26	17	17	22
Feb. 28	23	20	28	14
Mar. 28	17	14	21	18
Apr. 25	12	14	18	18
May 23	16	17	25	22
June 20	15	23	18	21
July 18	17	26	20	57
Aug. 15	28	98	31	160
Sept. 12	61	181	57	454
Oct. 10	57	227	53	
Nov. 7	44		45	
Dec. 5	28		37	

Poliomyelitis was much less prevalent in August in the United States than during the previous two years. The disease was also less prevalent in the Scandinavian countries.

Scarlet fever.—Scarlet-fever cases increased in Germany, the Netherlands, and especially in Poland during August and September, and in all three countries the incidence is higher than last year.

TABLE 8.—*Scarlet-fever cases reported in Poland, Germany, and the Netherlands, July 18–October 9, 1925 and 1926*

3 weeks ending—	Poland		Germany		Netherlands	
	1925	1926	1925	1926	1925	1926
Aug. 7	1,151	1,813	1,900	2,182	567	711
Aug. 28	1,200	2,388	2,167	2,812	673	704
Sept. 18	1,511	3,752	2,535	3,756	744	873
Oct. 9	1,798		2,965		1,040	1,211

In Poland scarlet fever was reported to be most prevalent in the populous centers and the highest incidence to be among the Jewish population. At Warsaw 14,000 children had been vaccinated against scarlet fever and only 2 cases out of 410 cases reported occurred among those previously vaccinated.

In Germany the disease is most prevalent in east Prussia, Brandenburg, Silesia, Saxony, and the Rhineland; least prevalent in Bavaria and Wurttemberg.

Diphtheria.—The incidence of diphtheria in Europe, on the whole, was slightly lower in August and the first half of September than it was last year. A slight increase over last year, however, was indicated in the reports for Poland, Hungary, Kingdom of the Serbs, Croats, and Slovenes, and Bulgaria.

In the United States about the same number of diphtheria cases were reported early in September as at the corresponding date last year.

Tuberculosis.—The mortality from tubereulosis in a number of large towns during the first half of 1926 is compared with the corresponding rates for 1925 in the following table. While the mortality from tuberculosis is usually higher in the first half year than in the second half year, and these rates, therefore, are not representative of the annual rate, they show, nevertheless, that the decline in tuberculosis mortality has continued in nearly all the towns.

TABLE 9.—*Mortality from tuberculosis in various cities during the first half year of 1925 and 1926*

Cities	Population in thousands	1925		1926		Increase or decrease
		Deaths	Rates per 100,000	Deaths	Rates per 100,000	
(a) Tuberculosis, all forms						
Europe:						*Per cent*
Lille	201	299	298	227	226	−24.2
Breslau	555	386	139	308	111	−20.1
Dresden	619	418	135	341	110	−18.5
Lyons	562	813	289	669	238	−17.6
Budapest	961	1,631	340	1,378	287	−15.6
Dublin	438	471	215	398	182	−15.3
Tallinn	127	198	312	170	268	−14.1
Berlin	4,014	2,559	128	2,221	111	−13.3
Munich	681	439	129	382	112	−13.2
Edinburgh	427	326	153	285	133	−13.1
Hamburg	1,079	703	130	611	113	−13.1
Oslo	258	230	178	204	158	−11.2
Glasgow	1,057	796	151	720	136	−9.9
Venice	201	234	233	211	210	−9.9
London	4,602	2,652	115	2,399	104	−9.6
Cologne	727	483	133	439	121	−9.0
Prague	713	690	194	642	180	−7.2
The Hague	398	177	89	170	85	−4.5
Rotterdam	552	330	120	316	115	−4.2
Stockholm	439	360	164	348	159	−3.0
Trieste	249	380	305	368	296	−3.0
Genoa	335	389	232	381	227	−2.6
Paris	2,906	4,488	309	4,373	301	−2.6
Thirty Swiss cities [1]	1,176	812	139	804	137	−1.4
Copenhagen	587	354	121	352	120	−0.8
Madrid	783	1,113	284	1,149	293	+3.1
Belfast	415	433	209	472	227	+8.6
Milan	857	685	160	747	174	+8.8
Bologna	221	192	174	217	196	+12.6
Amsterdam	718	352	98	399	111	+13.2
Cracow	187	230	246	285	304	+23.6

[1] In 1925, 26 cities only.

TABLE 9.—*Mortality from tuberculosis in various cities during the first half year of 1925 and 1926*—Continued

Cities	Population in thousands	1925		1926		Increase or decrease
		Deaths	Rates per 100,000	Deaths	Rates per 100,000	
(a) *Tuberculosis, all forms*—Continued						
America:						*Per cent*
San Francisco	558	323	116	303	109	−6.0
Sao Paulo	850	444	104	422	99	−4.8
St. Louis	822	312	76	244	59	−2.2
New Orleans	414	400	193	405	196	+1.6
Boston	780	424	109	433	111	+1.8
Chicago	2,995	1,350	90	1,398	93	+3.3
Asia: Manila	308	795	516	833	541	+4.8
(b) *Pulmonary tuberculosis*						
Europe: Sofia	154	366	475	444	577	+21.5
America:						
Montevideo	423	780	369	567	268	−27.4
New York	6,252	2,683	86	2,700	86	0
Asia:						
Madras [2]	527	653	307	625	294	−4.2
Singapore	396	615	311	663	335	+7.7
Bombay [2]	1,176	516	104	590	118	+13.5

[2] Twenty-two weeks only.

Trachoma.—Information on the prevalence of trachoma is shown in the table below:

TABLE 10.—*Trachoma cases reported in various countries, 1924–1926*

Country	Total, 1924	1925				1926	
		First quarter	Second quarter	Third quarter	Fourth quarter	First quarter	Second quarter
Germany	1,784	487	757	619	914	575	684
Austria	341	175	255	104	293	414	172
Danzig	54	9	11	17	12	11	9
Estonia	528	168	142	76	85	91	81
France	[1] 73	8	29	11	6	12	9
Lithuania	2,375	571	531	372	644	[2] 65	146
Malta	-------	89	71	123	259	107	184
Poland	2,954	1,012	1,057	962	1,720	1,400	2,094
Switzerland	13	2	12	1	1	5	4
Czechoslovakia	2,782	651	1,001	760	823	810	1,354
Saar Territory	3	4	0	1	10	4	0
U. S. S. R.:							
Governments and territories in Europe	362,890	139,401	166,602	149,045	105,057	78,210	-------
Ukraine	49,592	18,022	17,160	15,874	19,160	23,660	[3] 16,009
Transcaucasia	45,982	4,474	11,326	15,603	14,579	280	-------
Siberia	48,158	10,627	10,486	12,216	-------	1,561	-------
Kirghiz Republic	12,045	21,143				1,037	-------
Turkestan	6,648	23,181				-------	-------
Waterways, railways	648	986	994	614	842	1,590	-------
Tunisia	102	24	1	0	0	1	0
United States	3,260	392	487	444	628	316	734
New Zealand	20	10	5	4	10	3	5

[1] Compulsorily notifiable from Apr. 1, 1926.
[2] Month of March only.
[3] Data for April and May only.

SYNTHESIS AND INDICATOR PROPERTIES OF SOME NEW SULFONPHTHALEINS

By Barnett Cohen, Chemist, Hygienic Laboratory, United States Public Health Service

Sensitiveness, brilliant color, and general stability place the simpler sulfonphthaleins in the front rank of acid-base indicators. Although a few of these compounds have been known for some time, a fuller realization and utilization of their unique properties as indicators did not appear until Lubs and Clark (1915, 1916) reported some new syntheses, and Clark and Lubs (1916) proposed their selection of indicators for the determination of hydrions. Not only was a useful set of indicators presented by these authors but, as will be shown presently, there was implicit in their data the means for extending and modifying the series almost at pleasure. Indeed, given the requisite skill in organic synthesis, it would be no great exaggeration to claim the possibility of producing a sulfonphthalein of any desired apparent dissociation constant (useful indicator range) and of almost any color characteristics, within limitations.

The writer's attention was drawn to the problem specifically by the need for a sulfonphthalein substitute for methyl red (an azo compound) in the Clark and Lubs series. Hydrion color standards containing methyl red are notoriously unstable, and the indicator becomes unreliable when used in a biologically active medium, owing, presumably, to more or less reversible reduction and to decompositions. By comparison, the sulfonphthaleins as a class are much more stable. Hence the development of a sulfonphthalein substitute for methyl red would serve two useful purposes—(1) eliminate the unreliable methyl red and (2) render the Clark and Lubs series more uniform chemically.

Analysis of the data of Clark and Lubs led to the decision that di-halogenation of a meta-methyl phenol should produce the desired substitute, and experimental test resulting in the synthesis of tetrabrom-m-cresol sulfonphthalein (brom cresol green) verified this conclusion. Incidentally, a number of other compounds were prepared; and six of them appeared of sufficient value as indicators to merit further study and introduction into the Clark and Lubs series.[1]

The following report includes a description of the synthesis of the new sulfonphthaleins and of their absorption curves in the visible spectrum. The apparent dissociation constants were also determined, and data are presented on the salt and protein errors.

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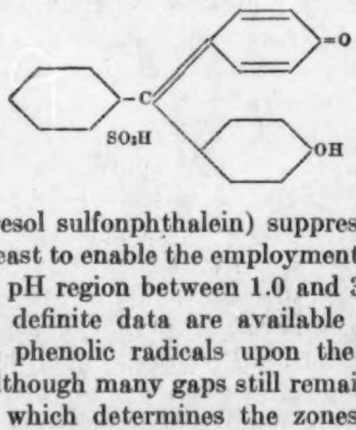
[1] A preliminary report on five of these compounds was made in 1923: Public Health Reports, 38, 199. Circumstances have prevented a more detailed report until now, but in the meantime the essential details for the synthesis of these compounds were made available to all inquirers.

EFFECTS OF SIMPLE SUBSTITUTIONS IN PHENOLSULFONPHTHALEIN UPON IONIZATIONS

Structurally phenolsulfonphthalein is a triphenylmethane derivative containing a sulfophenyl and two phenol radicals, the latter attached in their para positions to the methane carbon.

Rather little is known of the effects of substitution in the sulfophenyl radical upon dissociations in the compound (cf. Lubs and Acree, 1916). The dissociation in the strong sulfonic acid radical occurs in the extreme acid ranges, and theoretical considerations suggest that pronounced changes in the constant of this dissociation should be produced by substitutions in the sulfobenzoic acid nucleus. Consequently, should the need arise for the development of sulfonphthalein indicators for extremely acid regions, this type of substitution would be likely to yield compounds of the required indicator properties.

Although accurate comparative measurements of dissociation constants of the sulfonic acid in the different known sulfonphthaleins are not available, we do know that alkyl substitution in the position meta to the phenolic hydroxyl (such as is found in thymol sulfon-



phthalein and m-cresol sulfonphthalein) suppresses this dissociation greatly, enough at least to enable the employment of these compounds as indicators in the pH region between 1.0 and 3.0.

More useful and definite data are available as to the effects of substitution in the phenolic radicals upon the dissociation of the phenolic hydrion, although many gaps still remain to be filled in. It is this dissociation which determines the zones of color-change of most of the useful sulfonphthalein indicators. Such information as is available will be found in Table 1. The value of the dissociation constant K_a is expressed in terms of pK_a, which equals $\log \frac{1}{K_a}$. The names in parentheses are the common laboratory names proposed for the unwieldy ones of the more common compounds.

TABLE 1.—*Apparent dissociation constant of the phenolic hydrion in the sulfonphthaleins*

Substituted phenol	pK_a
2-isopropyl-5-methyl phenol (thymol blue)	8. 90
2, 3-dimethyl phenol (xylenol blue)	8. 9?
*2, 6-dimethyl phenol	8. 6
*3-methyl phenol (m-cresol purple)	8. 32

Substituted phenol	pK_a
2-methyl phenol (o-cresol red)	8.20
phenol (phenol red)	7.90
o-iodophenol	6.6
*o-bromophenol (brom phenol red)	6.16
*o-chlorophenol (chlor phenol red)	5.98
2, 6-dibromophenol (brom phenol blue)	4.05
*2-bromo-6-chlorophenol (brom-chlor phenol blue)	3.98
*2, 6-dichlorophenol	4.0?
2, 6-dinitrophenol	3.3?
6-bromothymol (brom thymol blue)	7.10
6-bromo-2, 3-xylenol	7.1?
6-bromo-2-methyl phenol (brom cresol purple)	6.30
*2, 6-dichloro-3-methyl phenol (chlor cresol green)	4.8
*2, 6-dibromo-3-methyl phenol (brom cresol green)	4.67

The compounds marked with an asterisk were synthesized by the author, and, with the exception of the 2, 6-dichlorophenol derivative (tetrachloro-phenolsulfonphthalein) were of sufficient purity to give well-defined dissociation constants. The sample of di-iodo-phenolsulfonphthalein (o-iodophenol derivative) was obtained from the National Aniline & Chemical Co. The data for the other compounds were obtained from Brode (1924), Clark, Cohen, and Elvove (1922), and A. Cohen (1922, 1923).

A mere inspection of this table discloses the following important facts: Alkyl groups depress the dissociation of the phenolic hydrogen and halogens increase it. Considering the effects of alkyl substitution more in detail, it will be noted that meta-substitution has a greater effect than ortho-substitution, that di-substitution has a greater effect than mono-substitution, and that a combination of ortho plus meta-substitution is more effective than di-ortho substitution. The data are not extensive enough to disclose the effect of the heavier isopropyl group as compared with the methyl.

Mono-halogenation in the ortho position increases the ionization of the phenolic hydrogen in the order, iodo < bromo < chloro. Attempts to prepare meta-halogen sulfonphthaleins have been unfruitful, but should the synthesis be accomplished, it will probably be found that the effect on ionization is rather less than that of ortho-halogenation. In terms of pK_a differences, di-halogenation has twice the effect of mono-halogenation. This mode of designating the effects on ionizations is very useful, but the reader should keep in mind that the pK_a differences are direct functions of differences between the *energies* of ionizations and not between the *magnitudes* of the dissociation constants.

Rather noteworthy is an apparent reversal in the order of effect upon ionization of the phenolic hydrion by chlorine and bromine in di-ortho halogenation on the one hand and tetra-ortho halogenation on the other. In phenolsulfonphthalein, dichlorination produces a

greater effect than dibromination; and while this effect seems to be only diminished (but not reversed) in tetra-chlor- and tetrabromphenolsulfonphthaleins, we find in the case of m-cresolsulfonphthalein that tetra-bromination has a greater effect than tetra-chlorination.

Analogous effects of approximately the same magnitude were found among the indophenols by Cohen, Gibbs, and Clark (1924a). Their data are reproduced here for purposes of comparison, because the parallelism with the sulfonphthaleins is instructive.

Indophenol system	pK.
carvacrol indophenol	8.8
thymol indophenol	8.7
m-cresol indophenol	8.5
o-cresol indophenol	8.4
phenol indophenol	8.1
m-bromophenol indophenol	7.7
o-bromophenol indophenol	7.2
o-chlorophenol indophenol	7.0

The effects of alkyl substitutions in both the indophenols and the sulfonphthaleins are almost identical. The papers by Cohen, Gibbs, and Clark (1924b) and by Gibbs, Cohen, and Cannan (1925) contain additional information of possible value in predicting the effects of substitution upon ionization of the phenolic hydrion in the sulfonphthaleins and perhaps other systems.

The effect of substitution on the dissociation of the phenolic hydrogen may be visualized somewhat as follows: If a group (or groups) substituted for hydrogen in the phenol nucleus pulls electron pairs toward itself more than the dissociable hydrogen pulls electron pairs toward itself, the escaping tendency of an electron pair should be lowered at least in the immediate neighborhood. This should become evident in an increased ionization of the hydrogen. The converse of this effect should occur if the substituent group tends to repel electron pairs. If alkyl groups be considered repellant and halogen attractive the effects would be those found here.

The dissociation constants of the ionizable groups depend on three factors—(1) the nature of the groups, (2) the influence of other groups, and (3) the effect of electrostatic forces between the ionizing groups. The nature of the groups determines the general order of magnitude of each constant. The other two factors have an influence dependent upon conditions. Each substituent produces an effect upon an ionizable group dependent upon the nature of the substituent and its position. In addition, work is expended in the liberation of the dissociable hydrogen from the electrostatic attraction of the charge or charges on the rest of the molecule.

The complete formulation of all these factors appears to be hopeless at the moment, but some promising attempts in this direction are being made (cf. Simms, 1926).

The above rather incomplete summary regarding the effects of substitution on ionization in the sulfonphthaleins was only partly available at the time we decided to seek the substitute for methyl red, but enough of it was implicit in Clark and Lubs' data to point the way.

Knowing approximately the magnitude and the direction of shift in pK_a value caused by introduction of halogen or methyl groups in the phenol nuclei of the phenolsulfonphthalein molecule, it was deduced that a tetra-halogenated m-cresolsulfonphthalein should have a pK_a value close to that of methyl red. Experimental test verified our deduction and resulted in the synthesis of m-cresol purple (pK_a 8.32) and brom cresol green (pK_a 4.67). The latter was proposed as a substitute for methyl red (pK 5.0). Since then chlor cresol green (pK 4.8) has been added. The useful pH ranges of these indicators are given below.

Methyl red	4.4–6.0
Chlor cresol green	4.0–5.6
Brom cresol green	3.8–5.4

Although these ranges are not identical, they are sufficiently close for practical indicator use; for it is well known that skillful manipulation of conditions permits accurate colorimetric readings beyond the "limits" of the useful ranges. In actual practice we have found that the new indicators can function as adequate substitutes for methyl red.

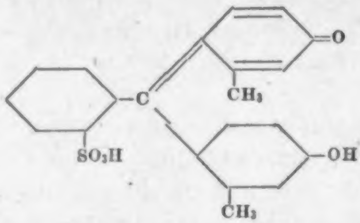
EXPERIMENTAL

m-Cresolsulfonphthalein.—A preliminary report by B. Cohen (1923) was the first announcement of the synthesis of this compound. While the present paper was in preparation there appeared the paper by Orndorff and Purdy [2] (1926) giving a competent elucidation of the chemistry of m-cresolsulfonphthalein.

Orndorff and his associates have shown that the condensation of a phenol with the anhydride of sulfobenzoic acid takes place in two stages, there being first formed an addition product, the intermediate acid, which then reacts with a second molecule of the phenol to give the sulfonphthalein. This process also takes place in the

[2] Orndorff and Purdy, referring to the preliminary report by B. Cohen (1923), state that the latter gave no details as to the method of preparation or the properties of these sulfonphthaleins (m-cresolsulfonphthalein and its tetrabromo derivative), nor were any analyses given. While this statement is correct, these authors appear to have unintentionally overlooked an exchange of letters between Orndorff and Cohen in 1923, in which Cohen responded to a request for information and gave the following essential facts: (1) m-cresol sulfonphthalein was made by condensation of m-cresol with sulfobenzoic acid anhydride at a temperature not exceeding 110° for 10 hours; (2) purification was obtained by dissolving the crude dye in an alkaline medium of about pH 10 to 11, filtering and reprecipitating with acid; (3) slow crystallization from approximately normal HCl or H_2SO_4 yields well-formed crystals with a metallic luster; and (4) analysis of the brominated product had shown it to be the tetra-brom product.

synthesis of m-cresolsulfonphthalein which possesses the following structure:



m-Cresol.—The m-cresol was obtained from Eastman (m-cresol, "practical") and was redistilled before use. The distillate boiled between 200–201° (755 mm.).

o-Sulfobenzoic acid anhydride.—This was made according to the method of White and Acree (1919) from saccharin. It was crystallized out of benzol, and retained a strong odor of benzol. The presence of the benzol was found to be not detrimental.

Condensation of m-cresol with o-sulfobenzoic acid anhydride.—The process must be carried out at a temperature below 110° if m-cresolsulfonphthalein is to be obtained. This has been confirmed by Orndorff and Purdy, who find that higher temperatures favor the formation of dimethylsulfonfluoran, the anhydride of the di-ortho compound. No particular advantage was noted in the employment of condensing agents like zinc chloride so far as improvement in the yield is concerned. The yield is low, between 15 and 20 per cent at the best, and is probably due to a retardative effect exerted by the meta-methyl group.

Crystalline o-sulfobenzoic acid anhydride, 30.8 gm., was added to 36.2 gm. of dry, redistilled m-cresol which had been warmed to 110°. The mixture was stirred and held for six hours in a bath kept at a temperature of 106°. The compound formation was followed by observing the amount of color produced by a test drop in 10 per cent sodium carbonate solution and in dilute acid. The fusion was terminated when color reached a maximum. The mixture was then steam distilled to remove m-cresol. Solid sodium carbonate was then added carefully to the hot solution until the color became deep purple. The solution was allowed to stand overnight to cool and settle out. It was filtered, the precipitate was discarded, and to the filtrate was slowly added concentrated hydrochloric acid until a deep red color developed. This solution was evaporated on the water bath under reduced pressure. Uniform, small green crystals of the sulfonphthalein separated as evaporation progressed. The crystalline product may be washed with cold water to remove adherent acid and salt, and is sufficiently pure (over 95 per cent) for ordinary indicator purposes. The yield up to this point was 12 gm., or about 19 per cent. The residues contain a considerable amount

of coloring matter, but attempts to recover more of the crystalline m-cresolsulfonphthalein from them have not been profitable. Purification is easily effected by dissolving the crystals in hot sodium carbonate solution, filtering, acidifying, and recrystallizing as above by evaporating the solution under reduced pressure.

Analyses.[3]—The air-dried crystals contained from 1 to 3 per cent cent of moisture. The material dried to constant weight at 110° gave the following analyses for sulfur: Substance, 0.1500, 0.1500, 0.1500; $BaSO_4$, 0.0891, 0.0903, 0.0911. Calculated for $C_{21}H_{18}O_5S$, S, 8.39 per cent. Found, 8.16, 8.27, 8.34 per cent. The compound has no definite melting point. It darkens and contracts at 230° and carbonizes at higher temperatures.

Indicator properties.—m-Cresolsulfonphthalein is a brilliant acid-base indicator, and the common name we have suggested for it is *meta-cresol purple*. Like the other sulfonphthaleins, it exhibits two distinct sets of color changes corresponding to the dissociations of the sulfonic acid and the phenolic hydrion, respectively. Unlike most sulfonphthaleins, however, its sulfonic acid dissociation (pK_a 1.51) is sufficiently repressed to make it useful as an indicator of acidity in the pH range 1.2 to 2.8, the corresponding color change being from red to yellow. This pH range and virage are identical with those of thymol sulfonphthalein in the Clark and Lubs series.

It has been found, however, that hydrion color standards of thymol blue in the acid range tend to fade with time.[4]

Since addition of alkali does not regenerate the faded color of thymol blue, it would seem that the loss of color is due to a decomposition rather than to a mere agglomeration of the dye by the high acidity. Under strictly comparable conditions, hydrion color standards containing meta-cresol purple do not suffer the disadvantage of this slow fading. (It is important to emphasize that the color fading we are now discussing is a slow one, being a matter of days or weeks, and does not affect the ordinary use of thymol blue).[5] We discover, therefore, in meta-cresol purple a brilliant and stable indicator of acidity in the pH region 1.2 to 2.8.

The second color change i· meta-cresol purple is from yellow to purple in the pH region 7.4 to 9.0, corresponding to the dissociation (pK_a 8.32) of the phenolic hydrion. In this zone this indicator shares with the other purple indicators the disadvantage of dichromatism, which interferes with the accurate matching of colors. The spectrophotometric data and measurements of the dissociation constants, salt, and protein effects are given in a later section.

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[3] I am indebted to Chemist Elias Elvove and Assistant Chemist C. G. Remsburg not only for the final analyses presented in this paper but also for numerous preliminary analyses controlling the steps in purification.

[4] This has also been noted by Dr. W. A. Taylor, of the LaMotte Chemical Co., Baltimore, who now proposes the use of meta-cresol purple as a substitute for thymol blue in the acid range.

[5] Holmes and Snyder (1925a) found this change to be appreciable spectrophotometrically within 24 hours.

Tetrabrom-m-cresol sulfonphthalein (*Brom cresol green*).—The synthesis of this compound was first announced in the preliminary report of B. Cohen (1923). It is briefly described by Orndorff and Purdy (1926). A solution of 25 gm. of bromine in 150 c. c. glacial acetic acid was added slowly to a suspension of 15 gm. m-cresol sulfonphthalein in 150 c. c. glacial acetic acid. The mixture was stirred and not allowed to heat above 30°. At intervals a drop was tested in buffer of pH 7. When the blue color reached a maximum residual bromine was removed by aeration. The mixture was then poured into 300 c. c. water and solid sodium bicarbonate was added until the solution turned definitely green. This was allowed to stand overnight and then filtered. Hydrochloric acid was then added and the solution evaporated. As the acetic acid evaporated off the product separated as a dark, reddish-brown amorphous mass. This material on recrystallization from glacial acetic acid gave a light yellowish product which melted at 217–218° (corr.).

Analyses.—Several lots of the compound dried to constant weight at 110° yielded the following analyses for sulfur and bromine: Substance, 0.3565, 0.2277, 0.1910, 0.2570; $BaSO_4$, 0.1185, 0.0765, 0.0623, 0.0817; substance, 0.1650, 0.1810, 0.1932, 0.2228; AgBr, 0.1780, 0.1933, 0.2175, 0.2543. Calculated for $C_{21}H_{14}$ Br_4O_5S; S, 4.59 per cent; Br, 45.80 per cent. Found, S, 4.56, 4.62, 4.48, 4.36 per cent; Br, 45.91, 45.45, 45.05, 46.09 per cent.

Indicator properties.—Tetrabrom-m-cresolsulfonphthalein is the compound proposed by B. Cohen (1923) as a substitute for methyl red, and the common name proposed for it is *brom cresol green*. It is far more stable in solution than methyl red, and its color changes are distinct. Brom cresol green may be used in the colorimetric determination of hydrion concentration in bacterial cultures to the same extent as the other sulfonphthaleins, although it should be remembered that even these rather stable indicators may be attacked by very active species. Hydrion color standards containing brom cresol green remain unaltered under proper conditions for long periods. The color change associated with the ionization of the phenolic hydrion is from yellow to blue (corresponding to the pH zone 3.8 to 5.4), the color at the midpoint, pK_a 4.67, being green. Owing to this moderately high dissociation, brom cresol green gives in ordinary tap water the characteristic blue color of the fully dissociated dibasic salt; and for the same reason this indicator is practically insensitive to CO_2.

The spectrophotometric data and measurements of the dissociation constants, salt, and protein effects are given in a later section.

Tetrachlor-m-cresolsulfonphthalein (*Chlor cresol green*).—Pure m-cresolsulfonphthalein, 8 gm., was suspended in 175 c. c. glacial acetic acid and was chlorinated by bubbling commercial tank chlorine

through the suspension. The subsequent procedure was substantially the same as in the preparation of the tetrabrom derivative. The tetrachlor product was finally recrystallized from glacial acetic acid, from which it separated out in small, brown, velvety tufts, melting at 200–201° (corr.). On analysis it was found to contain 6.1 per cent S and 27.0 per cent Cl; calculated for $C_{21}H_{14}Cl_4O_5S$, 6.17 per cent S, 27.27 per cent Cl.

Except for a determination of the pK_a by the Salm method, no very detailed examination of the compound was made, hence the data here given should be regarded as only approximate. The original purpose in preparing the compound was to determine the effect of tetrachlor substitution as compared with tetrabrom upon the dissociation of the phenolic hydrion.

The pK_a of the tetrachlor derivative was found to be 4.8, and we have seen above that in the tetrabrom compound it is 4.67. The color change in both compounds is the same, from yellow to blue, but the pH ranges are slightly different, corresponding to the differences in pK_a values. The pH range of chlor cresol green is 4.0 to 5.6, a slightly closer approach to the range of methyl red than is given by brom cresol green.

Dibrom-phenolsulfonphthalein.—In the colorimetric determination of hydrion concentration, a matter of minor importance but yet of great convenience is the color of the indicator itself, a factor which is determined by the nature of the solution as well as by the physiology and psychology of color perception. We may encounter amongst apparently normal persons a greater ease in distinguishing color gradations in the reds than in the blues, and vice versa. Another factor of still greater importance in this connection is the dichromatism especially of the purple indicators, which introduces real difficulties in the accurate matching of colors.

The elimination of such troublesome indicators is greatly to be desired if adequate substitutes can be found. In the Clark and Lubs series brom cresol purple and brom phenol blue are the chief offenders, and we have succeeded in producing an excellent substitute for the former in *brom phenol red* (dibrom-phenolsulfonphthalein) which is a clear red in solutions where brom cresol purple is either blue or red, according as the liquid layer is thin or thick.

Brom cresol purple has a pK_a value of 6.3, and from the fact that tetra-brom phenolsulfonphthalein has a pK_a of 4.05 while that of phenolsulfonphthalein is 7.90, it is to be expected that the dibrom compound should have a pK_a about midway between these two and therefore approximately that of brom cresol purple.

In addition it was expected that the color of the new compound in alkaline solution would show more of the red of phenol red and less

of the blue of brom phenol blue. This was deduced from the fact that halogenation in the sulfonphthaleins tends to introduce a blue component in the color of the unhalogenated compound. Thus, tetrabrom-phenolsulfonphthalein is blue while phenolsulfonphthalein is red, dibrom-o-cresolsulfonphthalein is purple while o-cresolsulfonphthalein is red, and dibrom-thymolsulfonphthalein is blue while thymolsulfonphthalein is purplish blue. This deduction was confirmed, but the elimination of the blue component occurred to a greater degree than was expected, for the alkaline color of dibromphenolsulfonphthalein exhibits only a slight suggestion of blue.

Sohon (1898) describes the synthesis and properties and gives analyses of a compound alleged to be dibrom-phenolsulfonphthalein. We find that although his analyses correspond to such a compound, the properties described are those of tetra-brom-phenolsulfonphthalein and the method of synthesis yields the tetra-brom product and nothing else. We are unable to account for the apparent discrepancy.

When phenolsulfonphthalein is brominated in glacial acetic acid (the method followed by Sohon) there results tetrabrom-phenolsulfonphthalein, and when the bromination is incomplete the result is a mixture of the unbrominated and tetra-brominated compounds. Analogous effects are produced by chlorination.

We have prepared the dibrom compound and found it to possess properties distinct from the tetra-brom. Moreover, we have confirmed its identity by brominating it and producing the tetra-brom derivative. The change in pK value of the successively brominated derivatives furnishes independent confirmatory evidence.

Synthesis.—The o-bromophenol employed came from two sources—some was prepared in this laboratory and some was purchased from Eastman Kodak Co. Thirty-four grams of o-bromophenol was heated to 140° and 18.1 grams o-sulfobenzoic acid anhydride was added and stirred in. The mixture was kept in an oil bath at 140° for about 10 hours, or until a test drop showed maximum color production. Water was then added and the mixture steam distilled to remove residual bromophenol. Solid sodium bicarbonate was then cautiously added until the solution was a deep bluish red. After standing overnight the solution was filtered. The filtrate was poured slowly into 20 per cent hydrochloric acid and the compound separated out in bright red granular masses. On standing the material assumed a crystalline form with a greenish lustre.

The product is surprisingly soluble in water. It was therefore thoroughly washed with dilute hydrochloric acid, dried over stick sodium hydroxide, and heated in the oven to remove adherent hydrochloric acid. The mother liquor contained a considerable proportion of the compound, which was recovered by evaporation and extraction

with n-butyl alcohol. The purified dibrom-phenolsulfonphthalein, recrystallized from glacial acetic acid, melted at 230° (corr.).

Analyses.—Substance, 0.2538, 0.1587; $BaSO_4$, 0.1159, 0.0713; substance, 0.1500, 0.1500; AgBr, 0.1100, 0.1104. Calculated for $C_{19}H_{12}O_5SBr_2$, 6.26 per cent S and 31.21 per cent Br. Found, 6.27, 6.17 per cent S, and 31.21, 31.32 per cent Br.

Indicator properties.—Dibrom-phenolsulfonphthalein, *brom phenol red* for short, has the brilliant indicator properties characteristic of the sulfonphthaleins. It is soluble in water to the extent of at least 0.2 per cent, yielding a golden yellow solution. In strongly acid solution it gives an orange-red color, in intermediate zones the color is yellow, and in alkaline solution it is deep red. Its useful range for the colorimetric determination of hydrions is between pH 5.2 and 6.8, corresponding to a pK_a of 6.16. Brom phenol red is an almost perfect substitute for brom cresol purple and is free from the disturbing property of dichromatism.

Purified brom phenol red appears to be perfectly stable, but we have noted in the case of some of our crude preparations a certain amount of fading. This tendency was eliminated by purification of the material. In this connection it is interesting to note that we found a specimen, labeled brom phenol red and sent to us for examination, to have the properties of phenol red and not of brom phenol red. This has also been encountered by Rous (1925). These, may however, be merely cases of accidental mislabeling.

In this connection it is possible that the fading of acid solutions of thymol blue, which we have previously discussed, may be due to impurities in that compound.

Dichlor-phenolsulfonphthalein.—This compound was made in order to determine the effect of dichlor substitution as against dibrom substitution on the ionization of the phenolic hydrion in the corresponding sulfonphthaleins.

Synthesis.—o-Chlorophenol was the starting material. Both the Eastman product and material prepared in this laboratory were used. Thirty-two grams of dry o-chlorophenol was heated to 130° and 23 grams crystalline o-sulfobenzoic acid anhydride was stirred in. The mixture was heated for six hours at 130°, or until a test drop showed maximum color formation. Water was then added and the mixture steam-distilled to remove residual chlorophenol. Sodium bicarbonate was then carefully added until the color became a deep bluish red, and the solution was allowed to stand overnight before filtering. Concentrated hydrochloric acid was added to the filtrate until a precipitate formed. This was filtered off and washed with dilute hydrochloric acid. Water can not be used for washing because of the solubility of the compound. The mother liquor was evaporated and a second crop of crystals was obtained. The adherent moisture

and hydrochloric acid may be driven off with heat. The crystals are very small and are of dark green color with a reddish tinge, and when ground the material is dark red. When recrystallized from glacial acetic acid it yields a product melting at 261–262° (corr.).

Analyses.—Substance, 0.1500, 0.1500; $BaSO_4$, 0.0810, 0.0815; substance, 0.1500, 0.1500; AgCl, 0.1017, 0.1020. Calculated for $C_{19}H_{12}O_5SCl_2$, 7.58 per cent S and 16.76 per cent Cl. Found, 7.42, 7.46 per cent S, and 16.77, 16.82 per cent Cl.

Indicator properties.—Dichlor-phenolsulfonphthalein, *chlor phenol red* for short, is very similar to brom phenol red in solubility and in indicator properties. Its alkaline color is a deep red with even less of a bluish cast than is seen in brom phenol red. The alkaline color of a commercial specimen of the corresponding di-iodo compound was found to be decidedly purplish. We see, therefore, that increasing weight of the halogen substituent tends to introduce an increasing amount of blue in the colors of the corresponding compounds.

The useful range of chlor phenol red for the colorimetric determination of hydrions is between 4.8 and 6.4, corresponding to a pK_a of 5.98. Chlor phenol red overlaps the range of brom cresol green on the one hand and of brom thymol blue on the other. Consequently, both methyl red and brom cresol purple, two objectionable compounds as above indicated, may be eliminated from the Clark and Lubs series of indicators without leaving a gap.

Dibrom-dichlor-phenolsulfonphthalein (Brom-chlor phenol blue).—By brominating dichlor-phenolsulfonphthalein or chlorinating the dibrom compound it is possible to obtain a dibrom-dichlor derivative. It was of interest to obtain this compound and compare its properties with those of the tetrabrom and tetrachlor derivatives.

Synthesis.—Dichlor-phenolsulfonphthalein was brominated in glacial acetic acid at room temperature. The bromination was terminated when a test drop showed maximum development of purple-blue color in alkaline solution. Residual bromine and hydrobromic acid were removed by aeration. Water was added and then solid sodium bicarbonate until the yellow color changed to a deep wine red. The solution was filtered after settling overnight, and to the filtrate was added concentrated hydrochloric acid. The compound separated out as a dark brown precipitate. The mother liquor was evaporated under reduced pressure, and a second crop was obtained. The material was recrystallized from benzol and glacial acetic acid, yielding a flesh-pink powder melting at 250–251° (corr.).

Analyses.—Substance, 0.2000, 0.2000; $BaSO_4$, 0.0773, 0.0752; substance, 0.2000; AgBr 0.1271; AgCl, 0.1013. Calculated for $C_{19}H_{10}O_5SBr_2Cl_2$, 5.52 per cent S, 27.51 per cent Br, 12.21 per cent Cl. Found, 5.31 and 5.16 per cent S, 27.05 per cent Br, 12.53 per cent Cl.

Indicator properties.—Dibrom-dichlor-phenolsulfonphthalein, ***bromchlor phenol blue*** for short, is very similar to brom phenol blue in indicator properties. It imparts a yellow color to mineral acid solutions of around 0.01N and a purplish blue to more alkaline solutions, in which is exhibited the troublesome dichromatism shared by brom phenol blue. Its useful range for the colorimetric determination of hydrions is between pH 3.0 and 4.6, corresponding to a pK_a of 3.98 for the ionization of the phenolic hydrion.

Comparing the pK_a values of the tetra-brom compound (4.05) and the dibrom-dichlor compound (3.98), we note that the effect is only a relatively slight increase in ionization of the phenolic hydrion when two bromine atoms are replaced by two chlorines. From this it may be inferred that the pK_a value of the tetra-chlor derivative will be shifted still further and to the same slight degree. A crude specimen of tetrachlor-phenolsulfonphthalein was prepared (but not purified or analyzed) and its pK_a value, as determined by the Salm (1906) method, was found to be about 4.0.

Xylenol-sulfonphthaleins.—Xylenol blue, made from 2, 3-dimethyl phenol has been synthesized by A. Cohen (1922). Its pK_a value is approximately 8.9, like that of thymol sulfonphthalein. It is to be expected that the compound made with 2, 5-dimethyl phenol will have approximately the same dissociation constant for the phenolic hydrion. On the other hand, the compound made with 2, 6-dimethyl phenol should show a lower pK_a value because of a lesser suppression of the phenolic ionization by o-methyl substitution as compared with m-methyl substitution. By the same reasoning, the compound made with 3, 5-dimethyl phenol (symmetrical m-xylenol) should show a much higher suppression of ionization of the phenolic hydrion (pK_a about 9.5).

We did not have available any 2, 5-dimethyl phenol for confirming the one aspect of our predictions, but 2, 6-dimethyl phenol[6] and 3, 5-dimethyl phenol were available. We found that condensation of 2, 6-dimethyl phenol with o-sulfobenzoic acid anhydride yielded a sulfonphthalein similar in indicator properties to xylenol blue and having a pK_a of 8.6. The compound (2, 6-xylenol sulfonphthalein) crystallized in beautiful, reddish bronze masses melting at 253–254° (corr.). No analyses were made. The behavior of this compound confirmed our prediction.

However, numerous attempts to prepare the symmetrical xylenol derivative were unsuccessful. Pure 3, 5-dimethyl phenol was prepared by the Knoevenagel reaction from ethyl aceto-acetate according to the method described by Gattermann (1923). The *sym*-xylenol was condensed in a variety of ways with the sulfobenzoic acid anhy-

[6] We are grateful to Dr. L. H. Marks, of the National Aniline & Chemical Co., who supplied us with a pure specimen of this compound.

dride, but no sulfonphthalein was obtained. We have already seen that the yield on condensing m-cresol with the anhydride is very low, and it would seem that the presence of two meta-methyl groups completely hinders the condensation to a sulfonphthalein by the ordinary procedure. Some other method of synthesis will have to be devised to produce this compound, and when it is accomplished we believe our prediction as to its pK_a value will be verified.

SPECTROPHOTOMETRIC MEASUREMENTS

Measurements in the visible and ultraviolet ranges of the spectrum made by Orndorff, Gibbs, Scott, and Jackson (1921) have shown that the sulfonphthaleins in neutral aqueous solution have two absorption bands. The addition of either acid or alkali results in the disappearance of one of the bands and the appearance of two new absorption bands, one on each side of the position of the band that disappears. The other band of the neutral solutions seems to be modified by the addition of acid, but with the addition of alkali it also disappears and a new band with lower frequency appears. In the case of dilute alkaline solutions the new type of absorption is not stable but reverts more or less rapidly to the two absorption bands found in the corresponding neutral solution. These changes and reversions indicate that in the neutral aqueous solutions the carbinol and hydrate forms of the sulfonphthalein are present and that on the addition of either acid or alkali a salt having a quinoid structure is formed.

The absorption curves of aqueous solutions of most of the new sulfonphthaleins were determined in the visible region with a Keuffel & Esser, Model E, direct reading color analyzer, employing tubes 10 cm. long. The wave-length scale was graduated to 5 millimicron intervals and the photometer in unit steps from zero to 100.

A stock aqueous solution was prepared containing 0.04 per cent of the indicator plus one equivalent of NaOH. The solution was diluted 1:9 with water, and this dilution was further diluted 1:19 with acid, alkali, or the required buffer (as indicated below) to produce complete color transformation and to permit viewing through a 10 cm. thickness of solution. The final concentration of indicator was 2.0 mg. per litre, except as noted in certain cases. The measurements were carried out at 30°.

The peaks of the absorption bands were found to be at the following wave lengths (1 $m\mu = 10^{-6}$mm $= 10$ Angstrom).

	$m\mu$
Meta-cresol purple (acid range)	533
Meta-cresol purple (alkaline range)	580
Brom cresol green	617
Chlor cresol green	612
Brom phenol red	574
Chlor phenol red	573
Brom-chlor phenol blue	596

We found the absorption peak of brom phenol blue to be at 593mμ, which is in fair agreement with the value (592mμ) found by Brode (1924). For brom cresol green, Holmes and Snyder (1925b) report the peak at approximately 614mμ, and we find it near 617mμ.

The absorption curves in the visible spectrum are shown in the accompanying charts (fig. 1) and the experimental data in Table 2. The absorptions are given in terms of $-\log_{10}$ transmittancy ($-\log_{10}T$), which is identical with the product of the thickness, concentration, and the specific transmissive index, k. (cf. Gibson et al., 1922).

m-Cresol purple.—The full acid color was developed in conc. HCl, the neutral color in Clark and Lubs' phthalate buffer of pH 4.6, and the alkaline color in N/5 NaOH.

Brom cresol green, chlor cresol green, brom phenol red.—The full alkaline colors were developed in Clark and Lubs' borate buffer of pH 10. The concentration of brom phenol red was 1.6 mg. per liter.

Chlor phenol red.—The full alkaline color was developed in N/5 NaOH.

Brom-chlor phenol blue.—The full alkaline color was developed in Clark and Lubs' borate buffer of pH 9.2.

TABLE 2.—*Absorption values in the visible spectrum (−log transmittancy)*

Wave length in mμ	m-cresol purple			Brom cresol green	Brom phenol red	Chlor phenol red	Brom-chlor phenol blue	Chlor cresol green
	Acid range in conc. HCl	Neutral range in buffer pH 4.6	Alk. range in 0.2 N NaOH					
700	----------	----------	----------	0.039	----------	----------	----------	----------
690	----------	----------	----------	.061	----------	----------	----------	0.000
680	----------	----------	0.000	.140	----------	----------	----------	.041
670	----------	----------	.018	.252	----------	----------	0.000	.119
660	0.000	----------	.022	.403	----------	----------	.022	.194
650	.004	----------	.071	.620	0.000	0.000	.041	.314
640	.009	----------	.131	.878	.013	.013	.066	.458
630	.013	0.000	.222	1.076	.027	.018	.201	.620
620	.018	.013	.377	1.122	.051	.081	.553	.708
610	.027	.013	.585	1.094	.155	.237	1.187	.744
600	.041	.018	.854	.991	.482	.620	1.602	.713
590	.092	.022	1.046	.870	.979	1.284	1.668	.668
580	.155	.025	1.007	.739	1.372	1.648	1.448	.588
570	.319	.026	1.071	.602	1.398	1.668	1.260	.523
560	.569	.027	.959	.498	1.222	1.462	1.046	.446
550	.921	.036	.824	.415	1.018	1.252	.903	.369
540	1.181	.051	.699	.337	.854	1.046	.710	.319
530	1.301	.071	.577	.244	.678	.886	.538	.244
520	1.097	.097	.475	.174	.538	.683	.432	.194
510	.921	.137	.372	.114	.398	.530	.314	.119
500	.620	.187	.297	.076	.319	.409	.208	.092
490	.469	.222	.237	.046	----------	.328	.174	.056
480	.347	.292	.155	----------	.194	.229	.119	.046
470	.244	.367	.143	----------	----------	.174	.092	.022
460	.149	.432	.119	----------	.097	.131	.046	----------
450	.125	.444	.032	----------	----------	.102	.000	----------
440	----------	.469	.000	----------	----------	.027	----------	----------

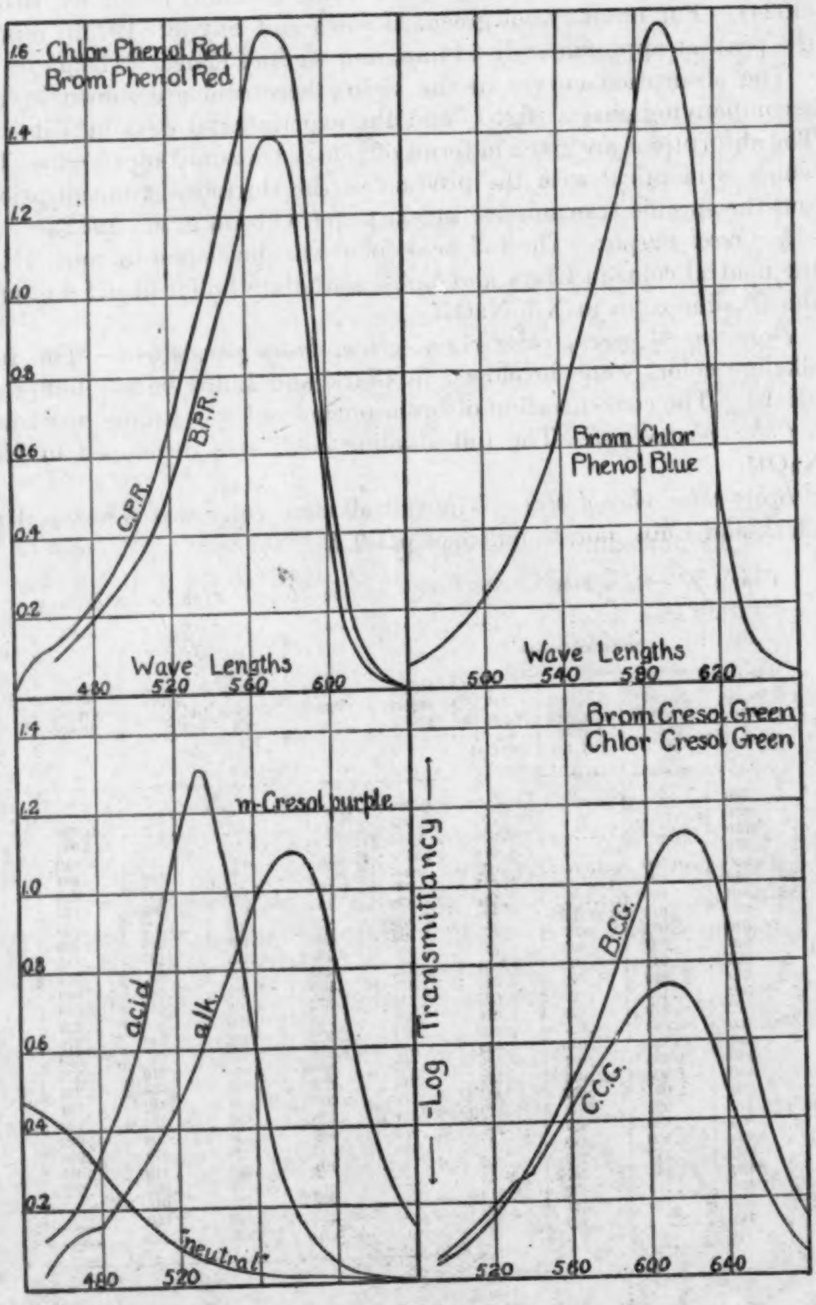
Chlor Phenol Red
Brom Phenol Red
C.P.R.
B.P.R.
Wave Lengths
480 520 560 600
Brom Chlor
Phenol Blue
Wave Lengths
500 540 580 620
m-Cresol purple
acid
alk.
"neutral"
480 520
-Log Transmittancy
Brom Cresol Green
Chlor Cresol Green
B.C.G.
C.C.G.
520 560 600 640
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2

FIG. 1

SPECTROPHOTOMETRIC DETERMINATION OF THE APPARENT DISSOCIATION CONSTANTS

The degree of transformation of an indicator within the range of its utility depends upon the hydrion concentration of its solution; and Brode (1924) and Holmes (1924, 1925) have shown how it may be measured with relative accuracy with the aid of the spectrophotometer. All that is necessary is to determine under comparable conditions of concentration and temperature the ratio of color absorption within the useful pH range of any wave length in the absorption band (preferably at the peak) to that of the same wave length in the completely transformed compound. This ratio gives the percentage dissociation of the indicator at the particular pH of the solution measured. The apparent dissociation constant, pK_a, of the indicator can then be calculated by the familiar equation:

$$pK_a = pH - \log \frac{\alpha}{1-\alpha}$$

where α is the degree of dissociation.

This procedure yields consistent results, and in the case of brom cresol green we have been able to confirm the value obtained by Holmes and Snyder (1925b).

Suitable dilutions of each indicator were made in acid, alkali, or Clark and Lubs' buffers, as the case required, to produce complete color transformation, and these were compared with the same quantity of indicator in buffers of known pH.

All measurements were carried out at 30°.

m-Cresol purple, acid range.—The acid form of the indicator is red, with an absorption band in the yellow, the peak lying at 533 mμ. The accurate determination of the dissociation constant depends on obtaining complete dissociation of the indicator, and we found concentrated HCl necessary to produce complete acid transformation of m-cresol purple, just as Holmes and Snyder did for the acid range of thymol blue. The results are summarized in Table 3.

TABLE 3.—*m-Cresol purple (acid range). Absorption maximum at 533mμ*

Buffer (pH)	pH electro metric	Conc. mg. per liter	T	$-\log T$	α	$\log \frac{\alpha}{1-\alpha}$	pK_a
Conc. HCl		1.6	7.7	1.1135	1.000		
1.2	1.224	1.6	18.3	.7375	.662	+0.2926	1.52
1.4	1.419	1.6	24.8	.6055	.544	+.0766	1.50
1.6	1.609	1.6	32.5	.4881	.438	−.1082	1.50
1.8	1.805	3.2	17.7	*.3760	.338	−.2920	1.51
2.0	2.000	3.2	26.1	*.2917	.282	−.4408	(1.55)
Average							1.51

* Corrected to concentration of 1.6 mg. per liter.

It will be seen from the table that the pK_a values obtained near the middle of the dissociation curve agree fairly closely, the average value being 1.51.

m-Cresol purple, alkaline range.—As the alkalinity of the indicator solution is increased through the pH range 7.0 to 11.0 the indicator becomes progressively and completely transformed to its alkaline form, which is purple in color, with an absorption band in the yellow, the peak lying at 580mμ. The apparent dissociation constant was determined spectrophotometrically, the fully transformed alkaline form of the indicator being produced in N/5 NaOH. The data are summarized in Table 4. The average pK_a value found is 8.32.

TABLE 4.—*m-Cresol purple (alkaline range). Absorption maximum at 580mμ*

Buffer (pH)	pH electrometric	Conc. mg. per liter	T	$-\log T$	α	$\log \frac{\alpha}{1-\alpha}$	pK_a
8.0	7.905	3.2	29.6	[1] 0.2644	0.274	+0.4242	8.33
8.2	8.108	3.2	18.3	[1] .3688	.382	+.2099	8.32
8.4	8.304	3.2	11.6	[1] .4678	.484	+.0278	8.33
8.6	8.500	3.2	7.1	[1] .5744	.594	−.1655	8.33
8.8	8.700	1.6	20.3	.6925	.716	−.4024	8.30
N/5 NaOH	----------	1.6	10.8	.9666	1.000	----------	----------
Average----	----------	----------	----------	----------	----------	----------	8.32

[1] Corrected to concentration of 1.6 mg. per liter.

Brom cresol green.—The peak of the absorption band of the alkaline form of this indicator lies at 617mμ. Clark and Lubs' borate buffer pH 9.6 was used to produce the alkaline transformation. The average pK_a value found is 4.67, which agrees with that found by Holmes and Snyder (1925b). Our experimental data are summarized in Table 5. In our preliminary note, B. Cohen (1923) this value was stated to be 5.0, as determined by the Salm method. We have found on subsequent repurification of the indicator that the apparent dissociation constant went down and remained constant at 4.67, although the bromine and sulfur analyses remained substantially unchanged (cf. Holmes and Snyder (1925b)).

TABLE 5.—*Brom cresol green. Absorption maximum at 617mμ*

Buffer (pH)	pH electrometric	Conc. mg. per liter	T	$-\log T$	α	$\log \frac{\alpha}{1-\alpha}$	pK_a
4.4	4.397	3.2	22.3	[1] 0.3259	0.343	+0.2827	4.68
4.6	4.597	1.6	37.8	.4225	.444	+.0970	4.69
4.8	4.800	1.6	28.6	.5436	.572	−.1254	4.67
5.0	4.998	1.6	22.3	.6517	.685	−.3383	4.66
5.2	5.198	1.6	18.3	.7375	.770	−.5389	4.65
9.6	----------	1.6	11.2	.9508	1.000	----------	----------
Average----	----------	----------	----------	----------	----------	----------	4.67

[1] Corrected to concentration of 1.6 mg. per liter

Brom phenol red.—The absorption peak of the alkaline form of this indicator lies near 574mμ. Clark and Lubs' borate buffer pH 10.0 was used to produce the full alkaline color. The average pK_a value found is 6.16, and the data are summarized in Table 6. We have noted in some specimens of this indicator a peculiarity not observed in the other sulfonphthaleins examined. Alkaline solutions of these specimens showed a progressive decrease in absorption with time. In other repurified specimens there was no such change, and we are therefore inclined to ascribe this peculiar behavior to impurities.

TABLE 6.—*Brom phenol red. Absorption maximum at 574mμ*

Buffer (pH)	pH electrometric	Conc. mg. per liter	T	$-\log T$	α	$\log \frac{\alpha}{1-\alpha}$	pK_a
6.0	5.956	1.6	27.8	0.5560	0.385	+0.2032	6.16
6.2	6.165	1.6	18.4	.7352	.509	−.0160	6.15
6.4	6.349	1.6	13.6	.8665	.600	−.1764	6.17
6.6	6.567	1.6	9.0	1.0458	.724	−.4197	6.15
6.8	6.760	1.6	7.1	1.1487	.796	−.5906	6.18
10.0	----------	1.6	3.6	1.4437	1.000	----------	----------
Average							6.16

Chlor phenol red.—The absorption peak of the alkaline form of this indicator lies near 573mμ. Clark and Lubs' borate buffer of pH 10.0 was used to produce the full alkaline color. The average pK_a value found was 5.98, and the data are summarized in Table 7.

TABLE 7.—*Chlor phenol red. Absorption maximum at 573mμ*

Buffer (pH)	pH electrometric	Conc. mg. per liter	T	$-\log T$	α	$\log \frac{\alpha}{1-\alpha}$	pK_a
5.6	5.592	3.2	11.5	[1] 0.4697	0.296	+0.3757	5.97
5.8	5.783	1.6	25.9	.5867	.370	+.2309	6.01
6.0	5.956	1.6	17.1	.7670	.484	+.0279	5.98
6.2	6.165	1.6	10.8	.9666	.610	−.1939	5.97
6.4	6.349	1.6	7.6	1.1192	.706	−.3807	5.97
10.0	----------	1.6	2.6	1.3850	1.000	----------	----------
Average							5.98

[1] Corrected to concentration of 1.6 mg. per liter.

Brom-chlor phenol blue.—The absorption peak of the alkaline form of this indicator lies at 596mμ. Clark and Lubs' borate buffer of pH 9.4 was used to produce the full alkaline color. The average pK_a value found is 3.98, and the data are summarized in Table 8.

TABLE 8.—*Brom-chlor phenol blue. Absorption maximum at 596mμ*

Buffer (pH)	pH electrometric	Conc. mg. per liter	T	−log T	α	$\log \frac{\alpha}{1-\alpha}$	pK$_a$
3.8	3.803	3.2	8.0	[1] 0.5485	0.386	+0.2013	4.00
4.0	3.997	1.6	18.9	.7235	.509	−.0163	3.98
4.2	4.195	1.6	12.6	.8996	.633	−.2375	3.96
4.4	4.397	1.6	9.0	1.0458	.736	−.4401	3.96
4.6	4.597	1.6	6.7	1.1739	.827	−.6783	(3.92)
9.4	----------	1.6	3.8	1.4202	1.000	----------	----------
Average	----------	----------	----------	----------	----------	----------	3.98

[1] Corrected to concentration of 1.6 mg. per liter.

"SALT ERRORS" OF THE NEW INDICATORS

In the absence of a satisfactory theory that will permit calculation of the salt errors of indicators, the only reliable procedure is to determine these errors by direct hydrogen electrode measurements. This has been done for those of the new sulfonphthaleins that are regarded as useful supplements to the Clark and Lubs series.

Sodium chloride was added to various Clark and Lubs buffers so as to bring the solutions to 1 molar concentration (the electrolyte in the 0.02 M buffer being calculated in terms of NaCl). For measuring the salt error of m-cresol purple, acid range, the "1 M" buffer contained 53.110 gm. NaCl, 250 c. c. M/5 KCl and 207.5 c. c. M/5 HCl per liter; for the alkaline range the "molar" buffer contained 52.268 gm. NaCl, 250 c. c. M/5 H_3BO_3, M/5 KCl and 29.5 c. c. M/5 NaOH. For brom phenol red and chlor phenol red the "molar" buffer contained 55.204 gm. NaCl, 250 c. c. M/5 KH_2PO_4 and 89.00 c. c. M/5 NaOH per liter. For brom cresol green and brom-chlor phenol blue the "molar" buffer contained 55.32 gm. NaCl, 250 c. c. M/5 KH-phthalate, and 18.5 c. c. M/5 NaOH per liter.

These "molar" solutions were then diluted to 0.5 M, 0.2 M, and 0.005 M.

Hydrogen ion measurements were taken of the various solutions, both electrometrically and colorimetrically, the basis of the colorimetric comparisons being the standard Clark and Lubs buffers. The measurements were all made at 30°. The hydrogen electrode determinations were referred to M/20 KH-phthalate (pH 3.97) as a standard. The indicator solutions were 0.04 per cent concentrations of the mono-sodium salts in water. These were prepared in the manner outlined by Clark (Determination of Hydrogen Ions, 2d ed., p. 80–81), the equivalents of N/20 NaOH per 100 mg. indicator being as follows:

Table 9.—*Quantities of NaOH to produce mono-sodium salts of indicators*

Indicator	Mol. weight	N/20 NaOH per 100 mg.
		c. c.
m-Cresol purple	382.2	5.3
Brom cresol green	698.0	2.9
Brom phenol red	512.1	3.9
Chlor phenol red	423.2	4.7
Brom-chlor phenol blue	581.0	3.4

The differences between the electrometric and colorimetric pH values were determined and are summarized in Table 10 as corrections.

Table 10.—*Salt effect on the new sulfonphthaleins*

[The values given below are corrections to be added to the colorimetric pH determinations to bring the values to the electrometric pH of the corresponding Clark and Lubs' buffers]

Molar conc. salt	m-Cresol purple		Brom cresol green	Brom phenol red	Chlor phenol red	Brom-chlor phenol blue
	Acid range	Alkaline range				
1.0	−0.14	−0.29	−0.32	−0.26	−0.26	−0.33
0.5	−.09	−.22	−.26	−.22	−.20	−.28
0.2	−.02	−.16	−.16	−.12	−.10	−.16
0.005	+.11	+.09	+.09	+.25	+.23	+.14

Similar results were obtained in another series of experiments with brom cresol green. In this case a normal sodium citrate solution was used, containing 250 c. c. molar citric acid and 500 c. c. normal NaOH. The colorimetric comparisons were made against Clark and Lubs' buffers. The pH corrections found for the salt effect are given below.

1.0 normal	−0.20
0.5 normal	−.19
0.2 normal	−.09
0.1 normal	−.03

The salt effect at high salt concentrations appears to be least for m-cresol purple in acid ranges and greatest for brom-chlor phenol blue. As the salt concentration decreases toward 0.1 molar the effect becomes practically negligible. With still greater dilutions the sign of the salt "error" changes and becomes quite appreciable at 0.005 molar salt (cf. Kolthoff, 1925, and Lepper and Martin, 1926).

"PROTEIN" EFFECT

Protein material in solutions containing indicators exerts specific effects on the colors, effects dependent on the nature not only of the indicator but also of the protein and apparently on its previous

treatment. The only safe procedure when attempting the colorimetric determination of pH in protein solutions is to calibrate the readings of the particular indicator in the specific protein solution with the hydrogen electrode.

The following data are presented merely to show the magnitude of the effect produced by a certain peptone upon the sulfonphthalein indicators. Incidentally, the sulfonphthaleins in the Clark and Lubs series were also included so as to have a comparable set of data. All observations were made at least in duplicate and were consistent. Colorimetric readings were made to the nearest 0.05 pH against Clark and Lubs' buffers. Quadruplicate hydrogen electrode measurements had to agree within 0.5 mv. before being accepted. The determinations were made at 30°.

The peptone solution was a 5 per cent concentration of Witte's peptone, which was boiled and filtered. To aliquots of this stock peptone solution were added small quantities of conc. HCl or NaOH to bring the pH within the range of the particular indicator studied. In most of the cases a more or less distinct opalescent haze appeared after the addition of acid or alkali, but the colorimetric and electrometric readings remained unchanged after filtration of such solutions.

The same experiment was repeated two months later. The same lot of peptone was used and apparently the same technic. The results disclosed certain divergencies which we are unable to explain. There was substantial agreement in the results for the indicators of the acid regions down to brom cresol green, but below that the two series tend to diverge. The data are summarized in Table 11.

TABLE 11.—"*Protein effect*" *on sulfonphthalein indicators*

[The values listed are the corrections to be added to colorimetric pH readings to bring them to the electrometric]

Indicator	In 5 per cent Witte peptone		Clark and Lubs[1]
	Series 1	Series 2	
m-Cresol purple (acid)	−0.20	−0.20	
Thymol blue (acid)	−.19	−.20	
Brom phenol blue	−.28	−.43	+0.05
Brom-chlor phenol blue	−.28	−.43	
Brom cresol green	−.10	−.13	
Chlor phenol red	+.09	−.07	
Brom phenol red	+.11	−.10	
Brom cresol purple	+.11	−.10	+.01
Brom thymol blue	+.34	+.07	+.10
Phenol red	+.24	−.01	+.04
Cresol red	+.02	−.03	+.03
m-Cresol purple (alk.)	+.03	−.02	
Thymol blue (alk.)	+.09	−.03	+.04

[1] In a 1 per cent peptone-beef infusion broth.

For purposes of comparison there is included in Table 11, under the column headed Clark and Lubs, the corrections found by these authors (1917) for a 1 per cent peptone-beef infusion broth. While a strict comparison could scarcely be considered valid, it nevertheless is useful in a rough survey of the ground. Our results show the general magnitude of the effect produced on the colorimetric reading by the presence of 5 per cent peptone. Their main value lies in again emphasizing the dictum that "protein effects" have to be determined experimentally for the material under examination and that calibration is not a simple matter.

SUMMARY

The following new sulfonphthaleins have been synthesized: m-cresolsulfonphthalein, tetra-brom-m-cresolsulfonphthalein tetra-chlor-m-cresolsulfonphthalein, dibrom-phenolsulfonphthalein, dichlor-phenolsulfonphthalein, dibrom-dichlor-phenolsulfonphthalein, and 2, 6-xylenol sulfonphthalein. The effects of substitution on dissociations in the sulfonphthaleins are discussed, and certain predictions based on an empirical formulation of the effects have been verified.

All but the last mentioned of these compounds are recommended as useful supplements to the Clark and Lubs series of acid-base indicators, or as substitutes for certain unsatisfactory members in that series. The new compounds have been studied as to their indicator properties, spectrophotometric behavior in the visible region, apparent dissociation constants, salt, and protein effects, The essential characteristics are summarized in Table 12.

Table 12.—*Summary of characteristics of the new sulfonphthalein indicators*

Sulfonphthalein	Common name	Absorption max.[1]	pK_a	Useful pH range	Color change
m-Cresol	m-Cresol purple	[2] 533	1.51	1.2–2.8	Red-yellow.
		[3] 580	8.32	7.4–9.0	Yellow-purple.
Tetra-brom m-cresol	Brom cresol green	617	4.67	3.8–5.4	Yellow-blue.
Tetra-chlor m-cresol	Chlor cresol green	612	4.8	4.0–5.6	Do.
Dibrom phenol	Brom phenol red	574	6.16	5.2–6.8	Yellow-red.
Dichlor phenol	Chlor phenol red	573	5.98	4.8–6.4	Do.
Dibrom dichlor phenol	Brom-chlor phenol blue	596	3.98	3.0–4.6	Yellow-blue.

[1] The absorption maxima are for the (alkaline) disodium salts, except in the case of m-cresol purple, acid range, where the value given refers to the absorption of the free acid.
[2] Acid.
[3] Alk.

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SMALLPOX IN MINNESOTA—1913–1925

In the Public Health Reports of December 3, 1926, page 2789, appears the statement that 1,298 cases of smallpox with 63 deaths had occurred in Minneapolis, Minn. Dr. A. J. Chesley, State health officer of Minnesota, advises that the number of deaths was 363, not 63, which gives a case fatality in this series of cases of more than 25 per cent.

Doctor Chesley sends the following statement of vaccination histories of smallpox cases which have occurred in Minnesota:

MINNESOTA, SMALLPOX

1925—Total cases, 973; total deaths, 198

Class A.—Successfully vaccinated within seven years before attack, 15 cases, or 1.54 per cent; 1 death, or 0.51 per cent.

Class B.—Successfully vaccinated over seven years before attack, 191 cases, or 19.63 per cent; 41 deaths, or 20.71 per cent.

Classes C and D.—Class C, never successfully vaccinated, and Class D, unable to give definite history of vaccination and no scar found, 767 cases, or 78.83 per cent; 156 deaths, or 78.78 per cent.

1913–1925—Total cases, 39,250; total deaths, 613

Class A.—661 cases, or 1.68 per cent of all; 1 death, or 0.16 per cent of all deaths from smallpox.

Class B.—1,976 cases, or 5.03 per cent of all; 89 deaths, or 14.52 per cent of all deaths from smallpox.

Classes C and D.—36,613 cases, or 93.28 per cent of all; 523 deaths, or 85.32 per cent of all deaths from smallpox.

Vaccination history of 505 fatal cases in Minnesota

	1924	1925	Total
Class A	0	1	1
Class B	47	41	88
Class C	243	151	394
Class D	17	5	22
Total	307	198	505

PUBLIC HEALTH ENGINEERING ABSTRACTS

Lead Poisoning From Food.—Anon. *The Lancet*, No. 5375, September 4, 1926, p. 507:

"The story is told in the *Presse Médical* of an outbreak of lead poisoning which commenced at Vidin, in Bulgaria, during April, 1923, and terminated only when its origin was detected five months later. By that time there had been 314 cases, occurring in 153 families, with three deaths, while several other deaths occurred among those poisoned as a result of other disorders considered to have been brought on or at least accentuated by the lead absorbed; notably one case of cancer of the rectum in a woman aged 28 is attributed to this cause. The number of cases ranks the epidemics with others, such as have followed upon accidentally mixing of white lead with flour, from drinking plumbo-solvent water by the royal household at Versailles in the eighteenth century, and from Loch Katrine, in Glasgow, at the end of the nineteenth century, and the 350 cases at Saint-Georges-sur-Eure in 1865. The signs and symptoms appear to have been quite typical; the blue line was present in 99 per cent of cases; lead colic was frequent and affections of the nervous system, with 3 cases (1 fatal) of encephalopathy. Nephritis and wrist drop, symptoms of chronic lead poisoning, were not observed. The source of the poisoning was found to be adulterated red pepper. This pepper, prepared from capsicum fruit, is much used in Hungary and Bulgaria, and it is often adulterated with such things as maize or vetch flour, sawdust, iron filings, or brick dust, but on this occasion analysis revealed the presence of 20.5 per cent of red lead and 4.1 per cent of sand, while very small amounts of true pepper were found.

This fraudulent "red pepper" was placed on the market by only one firm, and inhabitants who bought their red pepper elsewhere or made it themselves escaped. Most of the cases followed the ingestion of a number of small doses, a teaspoonful of pepper serving two to four persons for several days; but one case followed a single dose of two teaspoonfuls of "pepper," containing about 6 grains of red lead, taken at one meal; the case recovered."

Outbreak of Paratyphoid Fever Due to Infected Ice Cream.—J. P. Kinloch. (*The Medical Officer*. 1925, v. 34, pp. 191–192.) Abstract by W. G. Savage in *Bulletin of Hygiene*, vol. 1, No. 2, February, 1926, p. 101.

"An outbreak of 23 cases, all but 2 in Aberdeen, of paratyphoid fever in August, 1925. The symptoms were all of this disease and none were of food-poisoning type. For example, in all the cases the onset was characteristically insidious; and while vomiting was not uncommon, when present it was slight. In general, constipation and not diarrhea was the rule. Rose spots were present in most cases. Although a number of the cases were severe, there were no deaths. The incubation period was about 15 days.

"Careful epidemiological inquiry showed that the one article of food consumed in common was ice cream, obtained from one particular shop. The milk used to make the ice cream was naturally the object of suspicion, but milk from the same source used elsewhere produced no disease. About 6 gallons of milk were daily converted into ice cream on the incriminated premises. The staff on these premises was investigated, but no evidence of previous illness of any member was forthcoming and the bacteriological examinations were negative. It was not possible to ascertain how the ice cream became infected, but direct or indirect contamination by a paratyphoid B 'carrier' was considered as the most likely source. Investigations could not be undertaken until three weeks after the ice cream became infective.

"The outbreak was definitely proved to be paratyphoid fever by the isolation of *B. paratyphosus* B from the feces of eight sufferers and from the urine of two cases, and by the demonstration of specific agglutinins in the blood of all the cases.

"A point of interest is that the ice cream on the day it was infective was distributed to between 120 to 360 people, while only 23 developed the disease. Probably only part of it was infected and the freezing prevented distribution of the bacilli throughout the whole mass."

Clean and Safe Milk Campaign to Stimulate Use.—S. J. Crumbine, general executive, American Child Health Association, New York City. *The Nation's Health*, vol. 8, No. 8, August, 1926, pp. 530–532. (Abstract by H. N. Old.)

Some very significant facts and figures on milk-borne epidemics of communicable diseases are tabulated and commented upon, as obtained from questionnaires covering 42 States, the District of Columbia, 3 Territories, and 3 Canadian Provinces.

During 1924 and 1925, 43 and 44 such epidemics are reported, respectively, with a total for the two years of 3,286 cases and 130 deaths, typhoid epidemics constituting 72 per cent of the total reported.

The danger from tuberculous cows is dwelt upon at length and the conclusion reached by Park and Krumwiede is stated—that 27 per cent of tubercular children under 5 and 25 per cent of those between 5 and 16 years of age are found to have infection of the bovine type.

Up to the present time 12 States have been surveyed, 179 towns covered, 3,945 supplies and 4,928 samples examined for visible dirt, bacteriological contamination, and detection of adulteration, Standard Methods being followed. Summarizing the survey results, it is stated that 77 per cent of the samples were classed as dirty, 58 per cent showing bacterial count over 100,000, with 43 per cent positive for colon bacillus, and about 14 per cent adulteration.

The objectives of the campaign are, first, stimulation of the production and distribution of an abundant, clean, and safe milk supply; second, to center the responsibility for such production and distribution on dairymen, milk dealers, and State and local dairy and health officials; and third, to promote increased consumption of milk after reasonable assurance of its safety.

The by-products of the survey thus far are said to be most encouraging, resulting in the promotion of a clean-up among the dairymen and dealers, provision of local supervision using laboratory examinations in many instances, and commitments made toward a general tightening of milk-control regulations.

While the survey shows the daily per capita milk consumption to be only 0.6 to 0.8 pint, the conclusion is reached that, in many communities, increased consumption should not be urged until the safety of the supply is assured.

The organizations cooperating actively in this work are the American Child Health Association, the Association of Dairy, Food, and Drug Officials, and the Conference of State and Provincial Health Authorities.

Bacterial Flora of the Market Oyster.—Calista Eliot. *The American Journal of Hygiene*, vol. 6, No. 6, November, 1926, p. 755.

(1) Shucked oysters and shell oysters kept at the laboratory temperatures show a sudden and maximum rise in total count from the second to the fourth day of storage; (2) the *Bacillus coli* score of oysters stored in a cool basement increased from 4 to 500,000 in 14

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days; as signs of spoilage appeared, the *Bacillus coli* score decreased; (3) hydrogen ion determinations on oysters spoiling in the shell showed little change in acidity; shucked oysters, however, became markedly acid during the first few days of spoilage; later, there was a reversal of reaction and the original pH was regained and maintained; (4) in the ice box the rise in acidity lagged two or three days behind and remained at a slightly lower level than at room temperature; at ice-box temperature the maximum total count was about one-tenth of the maximum count at room temperature; (5) the bacteria of the decomposing oyster may be divided into five principal groups—(*a*) the colon-aerogenes group; (*b*) the streptococci; (*c*) the 'water bacteria,' including members of the green fluorescent, the yellow pigmented, and the nonpigmented groups, and vibrios; (*d*) the anaerobes; and (*e*) the incidental organisms, such as the chromogenic cocci and the aerobic spore formers; (6) in shucked oysters the souring process may be initiated by either the colon-aerogenes group or the streptococci; if the streptococci are present in large numbers, the colon-aerogenes group is inhibited by the second day; (7) after a varying period of time, 12 days or longer, the water forms multiply rapidly, there is a reversion in reaction and actual decomposition of the oyster meat begins. Certain members of the green pigmented and the yellow pigmented groups produce changes in sterilized oysters comparable to those observed in the decomposition of market oysters; there is a slimy chromogenic growth and a marked softening, and, in some instances, liquefaction of the oyster meat when these organisms are grown upon them; members of these groups are always found abundantly in spoiling oysters; other water forms which are also abundant in the spoiling oyster do not initiate decomposition processes in sterilized oysters; (8) several types of anaerobes multiply in spoiling oysters and produce large amounts of gas, but apparently bring about no putrefactive changes.

Summary of the Purpose and Principles of Aeration of Water Supplies.—C. A. Emerson, jr. Proceedings of Eighth Texas Water Works Short School, Bulletin No. 1, January 23, 1926, pp. 78–83. (Abstract by W. H. Wendler.)

The aeration of ground water is usually for the purpose of the oxidation of iron, manganese, or organic matter and for removing volatile odors and gases such as carbon dioxide and hydrogen sulphide. These constitutents, when present to excess, impart color, turbidity, and sometimes taste to the water, and by deposit cause staining of plumbing fixtures and white clothing in the laundry. Carbon dioxide also dissolves iron from the interior of the mains. There have been instances in which samples of tap water showed six or more parts per million of iron in contrast to one part per million at the well.

Where iron is present it is readily changed by oxidation from the soluble ferrous form to the insoluble ferric hydrate, only one part of oxygen being required to oxidize seven parts of iron. It has been found that if the dissolved oxygen content were permitted to rise above 50 per cent saturation, the iron and manganese could not be satisfactorily removed. In some Massachusetts plants where manganese and organic matter interfered with precipitation of iron in fully aerated water, the tricklers were operated as submerged contact beds.

Aeration for removal of tastes and odors due to industrial waste pollution, particularly 'phenol' wastes from by-product coke ovens and wood distillation plants, has been of little practical value in most instances.

Sometimes surface supplies, taken from the lower levels of large reservoirs or from rivers which have been ice blocked for long periods, are somewhat deficient in oxygen, and in these instances aeration was helpful.

Connecting Safe and Unsafe Water Supplies.—Anon. *Public Works*, vol. 57, No. 8, September, 1926, pp. 281–282. (Abstract by Dana E. Kepner.)

At the conference this year of the State sanitary engineers a committee on cross-connections presented a report recommending the adoption by the conference of resolutions providing that "no physical connections should be permitted between any potable public water supplies, either through cross-connections, auxiliary intakes or by-passes, and other supplies except as follows: (1) With another potable public water supply; or (2) with a potable supply which is regularly examined as to its quality by those in charge of the potable public supply to which the connection is made." A cross-connection is defined as any physical connection whereby a potable public water-supply system is connected with another water-supply system, whether public or private, in such a manner that a flow of water into the potable supply is possible therefrom, directly through the manipulation of gate valves, because of ineffective check or back-pressure valves, or otherwise.

The results from a questionnaire sent to the various State boards of health dealing with existing regulations in this respect are given.

Garbage Collection and Disposal.—Anon. *Public Works*, vol. 57, No. 10. November, 1926, pp. 385–387. (Abstract by C. L. Pool.)

This article is the first of a series in review of a symposium on garbage collection and disposal held by the sanitary engineering division of the American Society of Civil Engineers. Six papers constituting the article were as follows: A general review of the problem, by Samuel A. Greeley; a description of practice at Lansing,

Mich., by Edward D. Rich; the same for the hog feeding for Los Angeles, Calif., by W. T. Knowlton; a description of the Beccari system at Scarsdale, N. Y., by Arthur Boniface; one of high temperature incineration at Toronto, Canada, by A. J. Burnett; and one of the Cobwell system of garbage reduction at Rochester, N. Y., by John V. Lewis.

Mr. Greeley discussed administrative and engineering problems encountered and outlined the procedure recommended to cities confronted with the problem. In connection with incineration specifications recently prepared by him the work was classified under five heads: (1) Incinerator furnaces and appurtenances; (2) incinerator building and scale; (3) chimney; (4) runway; and (5) sewers and sewage-disposal plant. A list of reduction plants in operation noted whether each was operated by the city or by a contractor. The Kansas City contract allows disposal by any satisfactory method. The contract price (1925) was $6.45 a ton for collection and $1 a ton for disposal.

Can collection practice at Lansing, Mich., is emphasized and constructional details of cans are given. Frequency and methods of collection are outlined and costs given include $0.91 per capita of the population served for collection in 1924.

Los Angeles practice is discussed, with quantities and costs noted. Material rejected by the pigs is covered with gypsum to conserve the ammonia content, dried, and ground for use as fertilizer.

Examination for Entrance into the Regular Corps of the United States Public Health Service

Examinations of candidates for entrance into the Regular Corps of the United States Public Health Service will be held at the following-named places on the dates specified:

Washington, D. C	February 7, 1927
Chicago, Ill	February 7, 1927
New Orleans, La	February 7, 1927
San Francisco, Calif	February 7, 1927

Candidates must be not less than 23 nor more than 32 years of age, and they must have been graduated in medicine at some reputable medical college, and have had one year's hospital experience or two years' professional practice. They must pass satisfactorily, oral, written, and clinical tests before a board of medical officers and undergo a physical examination.

Successful candidates will be recommended for appointment by the President, with the advice and consent of the Senate.

Requests for information or permission to take this examination should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C.

DEATHS DURING WEEK ENDED DECEMBER 18, 1926

Summary of information received by telegraph from industrial insurance companies for week ended December 18, 1926, and corresponding week of 1925. (From the Weekly Health Index, December 22, 1926, issued by the Bureau of the Census, Department of Commerce)

	Week ended Dec. 18, 1926	Corresponding week, 1925
Policies in force	65, 797, 778	62, 410, 497
Number of death claims	12, 674	12, 128
Death claims per 1,000 policies in force, annual rate	10. 0	10. 1

Deaths from all causes in certain large cities of the United States during the week ended December 18, 1926, infant mortality, annual death rate, and comparison with corresponding week of 1925. (From the Weekly Health Index, December 22, 1926, issued by the Bureau of the Census, Department of Commerce)

City	Week ended Dec. 18, 1926		Annual death rate per 1,000 corresponding week, 1925	Deaths under 1 year		Infant mortality rate, week ended Dec. 18, 1926 [2]
	Total deaths	Death rate [1]		Week ended Dec. 18, 1926	Corresponding week, 1925	
Total (65 cities)	7, 237	13. 1	13. 0	787	771	[3] 66
Akron	27			2	3	22
Albany [4]	37	16. 2	23. 0	1	3	21
Atlanta	64			5	10	
White	29			2	7	
Colored	35	(5)		3	3	
Baltimore [4]	222	14. 3	13. 3	24	15	73
White	162			16	11	60
Colored	60	(5)		8	4	127
Birmingham	55	13. 6	20. 0	10	3	
White	28			4	1	
Colored	27	(5)		6	2	
Boston	209	13. 8	15. 4	31	31	87
Bridgeport	33			5	6	85
Buffalo	127	12. 2	14. 1	12	20	50
Cambridge	28	12. 0	13. 5	8	6	142
Camden	37	14. 7	12. 1	9	4	151
Canton	29	13. 7	8. 8	3	3	66
Chicago [4]	696	11. 9	12. 2	64	80	56
Cincinnati	127	16. 1	17. 7	9	17	56
Cleveland	184	10. 0	10. 3	16	30	42
Columbus	93	17. 0	12. 1	7	3	65
Dallas	50	12. 8	16. 4	5	18	
White	39			5	16	
Colored	11	(5)		0	2	
Denver	90	16. 5	14. 7	15	7	
Des Moines	40	14. 3	8. 5	6	0	100
Detroit	274	11. 1	11. 5	48	45	78
Duluth	24	11. 1	11. 3	6	2	139
El Paso	26	12. 4	12. 4	6	4	
Erie	36			5	7	98
Fall River [4]	33	13. 1	10. 5	6	5	94
Flint	40	15. 3	7. 6	16	5	271
Fort Worth	38	12. 5	10. 1	3	6	
White	34			2	5	
Colored	4	(5)		1	1	
Grand Rapids	32	10. 7	9. 5	6	5	86
Houston	46			4	11	
White	35			4	5	
Colored	11	(5)		0	6	
Indianapolis	104	14. 8	15. 5	7	7	53
White	87			5	6	44
Colored	17	(5)		2	1	115
Jersey City	62	10. 2	11. 9	6	15	45
Kansas City, Kans	25	11. 1	11. 7	1	4	19
White	22			1	3	22
Colored	3	(5)		0	1	0
Kansas City, Mo	116	16. 1	12. 1	9	7	
Los Angeles	261			31	22	86

(See footnotes at end of table.)

Deaths from all causes in certain large cities of the United States during the week ended December 18, 1926, infant mortality, annual death rate, and comparison with corresponding week of 1925. (From the Weekly Health Index, December 22, 1926, issued by the Bureau of the Census, Department of Commerce)—Continued

City	Week ended Dec. 18, 1926		Annual death rate per 1,000 corresponding week, 1925	Deaths under 1 year		Infant mortality rate, week ended Dec. 18, 1926 [2]
	Total deaths	Death rate [1]		Week ended Dec. 18, 1926	Corresponding week, 1925	
Louisville	86	14.4	13.6	4	6	34
White	62			3	5	29
Colored	24	(5)		1	1	70
Lowell	22			1	7	19
Lynn	25	12.5	13.7	1	5	26
Memphis	66	19.4	21.2	9	8	
White	29			2	5	
Colored	37	(5)		7	3	
Milwaukee	107	10.8	9.2	19	11	90
Minneapolis	101	12.1	14.2	6	11	33
Nashville [4]	45	17.1	15.0	5	1	
New Bedford	20			2	2	35
New Haven	46	13.2	11.1	4	3	55
New Orleans	163	20.3	19.5	14	12	
White	90			8	7	
Colored	73	(5)		6	5	
New York	1,524	13.4	12.3	148	140	60
Bronx Borough	173	10.0	10.8	17	16	57
Brooklyn Borough	550	12.8	10.9	57	45	58
Manhattan Borough	630	17.5	16.1	56	62	62
Queens Borough	128	8.7	7.9	15	14	68
Richmond Borough	43	15.7	16.6	3	3	53
Newark, N. J	90	10.2	13.1	14	11	67
Norfolk	23	6.9	12.0	4	4	81
White	11			1	3	33
Colored	12	(5)		3	1	159
Oakland	52	10.4	11.1	6	5	70
Oklahoma City	26			4	4	
Omaha	58	14.0	15.7	6	9	64
Paterson	35	12.8	11.4	5	2	84
Philadelphia	508	13.2	14.6	46	55	61
Pittsburgh	176	14.4	13.4	25	18	83
Portland, Oreg	68			2	2	20
Providence	59	11.2	14.0	5	2	42
Richmond	53	14.6	14.9	8	3	100
White	35			4	0	78
Colored	18	(5)		4	3	139
Rochester	62	10.1	13.8	5	6	40
St. Louis	220	13.8	14.5	15	21	
St. Paul	58	12.2	12.1	2	4	18
Salt Lake City [4]	28	11.0	11.5	8	3	122
San Antonio	40	10.2	14.7	11	10	
San Diego	51	24.2	20.7	3	4	64
San Francisco	154	14.2	12.0	6	8	36
Schenectady	25	14.0	8.4	7	4	201
Seattle	76			10	4	96
Somerville	29	15.1	15.3	1	3	28
Spokane	24	11.5	14.8	1	3	23
Springfield, Mass	37	13.3	10.3	5	3	77
Syracuse	53	14.9	13.2	3	7	38
Tacoma	29	14.3	10.0	1	0	24
Toledo	75	13.3	10.0	10	7	96
Trenton	34	13.2	17.8	6	8	102
Utica	36	18.2	15.4	3	3	68
Washington, D. C	120	11.9	12.6	13	16	74
White	74			8	9	67
Colored	46	(5)		5	7	91
Waterbury	21			1	4	24
Wilmington, Del	21	8.8	13.2	4	2	89
Worcester	53	14.3	11.5	5	3	60
Yonkers	35	15.7	8.3	6	1	135
Youngstown	38	12.0	11.1	9	4	114

[1] Annual rate per 1,000 population.
[2] Deaths under 1 year per 1,000 births. Cities left blank are not in registration area for births.
[3] Data for 63 cities.
[4] Deaths for week ended Dec. 17, 1926.
[5] In the cities for which deaths are shown by color, the colored population in 1920 constituted the following percentages of the total population: Atlanta, 31; Baltimore, 15; Birmingham, 39; Dallas, 15; Fort Worth, 14; Houston, 25; Indianapolis, 11; Kansas City, Kans., 14; Louisville, 17; Memphis, 38; Nashville, 30; New Orleans, 26; Norfolk, 38; Richmond, 32; and Washington, D. C., 25.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary and the figures are subject to change when later returns are received by the State health officers

Reports for Week Ended December 25, 1926

ARIZONA

	Cases
Chicken pox	2
Diphtheria	3
German measles	23
Paratyphoid fever	1
Scarlet fever	3
Smallpox	1
Tuberculosis	21
Typhoid fever	1

ARKANSAS

	Cases
Chicken pox	21
Diphtheria	8
Influenza	35
Malaria	3
Measles	1
Scarlet fever	9
Smallpox	1
Tuberculosis	1
Typhoid fever	3

COLORADO

	Cases
Cerebrospinal meningitis	1
Chicken pox	15
Diphtheria	9
Measles	4
Mumps	1
Pneumonia	3
Scarlet fever	31
Smallpox	1
Tuberculosis	97
Whooping cough	1

CONNECTICUT

	Cases
Cerebrospinal meningitis	1
Chicken pox	81
Diphtheria	18
German measles	3
Influenza	2
Measles	29
Mumps	17
Pneumonia (all forms)	55
Poliomyelitis	1
Scarlet fever	60

CONNECTICUT—continued

	Cases
Septic sore throat	1
Trachoma	1
Tuberculosis (all forms)	14
Typhoid fever	2
Whooping cough	28

DELAWARE

	Cases
Influenza	2
Scarlet fever	14
Tuberculosis	4
Typhoid fever	2
Whooping cough	3

FLORIDA

	Cases
Cerebrospinal menigitis	1
Chicken pox	21
Diphtheria	30
Influenza	3
Malaria	4
Measles	8
Mumps	16
Paratyphoid fever	1
Pneumonia	5
Scarlet fever	13
Smallpox	39
Tetanus	1
Tuberculosis	11
Typhoid fever	4
Whooping cough	5

IDAHO

	Cases
Chicken pox	4
Diphtheria	3
Measles	57
Pneumonia	4
Scarlet fever:	
Nampa	15
Scattering	27
Smallpox	1
Tuberculosis	1
Typhoid fever	1

ILLINOIS

	Cases
Cerebrospinal meningitis:	
Cook County	3
Chicken pox	360
Diphtheria	110
Influenza	37
Lethargic encephalitis:	
Cook County	1
Measles	577
Mumps	82
Pneumonia	291
Scarlet fever	234
Smallpox	20
Tuberculosis	267
Typhoid fever	16
Whooping cough	148

KANSAS

Chicken pox	169
Diphtheria	19
Influenza	6
Measles	34
Mumps	14
Pneumonia	35
Scarlet fever	77
Septic sore throat	1
Smallpox:	
Seneca	13
Topeka	10
Scattering	6
Tuberculosis	62
Typhoid fever	1
Whooping cough	9

LOUISIANA

Diphtheria	17
Influenza	11
Lethargic encephalitis	1
Malaria	6
Measles	24
Pneumonia	26
Poliomyelitis	1
Scarlet fever	9
Smallpox	1
Tuberculosis	32
Typhoid fever	6

MAINE

Chicken pox	43
Diphtheria	1
German measles	1
Influenza	4
Measles	78
Mumps	16
Pneumonia	17
Scarlet fever	42
Tuberculosis	6
Typhoid fever	1
Vincent's angina	2
Whooping cough	33

MARYLAND [1]

Cerebrospinal meningitis	2
Chicken pox	146
Diphtheria	48
German measles	1

[1] Week ended Friday.

MARYLAND—continued

	Cases
Influenza	42
Measles	27
Mumps	22
Paratyphoid fever	1
Pellagra	1
Pneumonia (all forms)	77
Scabies	1
Scarlet fever	68
Septic sore throat	4
Tuberculosis	27
Typhoid fever	11
Typhus fever	1
Whooping cough	67

MASSACHUSETTS

Cerebrospinal meningitis	2
Chicken pox	265
Conjunctivitis (suppurative)	4
Diphtheria	104
German measles	7
Influenza	14
Lethargic encephalitis	1
Measles	59
Mumps	140
Ophthalmia neonatorum	25
Pneumonia (lobar)	72
Poliomyelitis	1
Scarlet fever	236
Septic sore throat	2
Tuberculosis (all forms)	113
Typhoid fever	31
Whooping cough	115

MICHIGAN

Diphtheria	63
Measles	66
Pneumonia	60
Scarlet fever	154
Smallpox	19
Tuberculosis	13
Typhoid fever	1
Whooping cough	89

MONTANA

Chicken pox	11
Diphtheria	7
Measles	73
Mumps	9
Scarlet fever	103
Smallpox	10
Typhoid fever	3

NEW JERSEY

Anthrax	1
Chicken pox	145
Diphtheria	78
Influenza	11
Measles	21
Pneumonia	86
Scarlet fever	127
Typhoid fever	1
Whooping cough	102

NEW YORK

(Exclusive of New York City and Syracuse)

	Cases
Anthrax	1
Cerebrospinal meningitis	3
Chicken pox	278
Diphtheria	76
Dysentery	1
German measles	41
Lethargic encephalitis	1
Measles	571
Mumps	103
Ophthalmia neonatorum	2
Paratyphoid fever	1
Pneumonia	200
Poliomyelitis	2
Scarlet fever	149
Smallpox	6
Trachoma	1
Typhoid fever	9
Vincent's angina	6
Whooping cough	154

OREGON

	Cases
Cerebrospinal meningitis	1
Chicken pox	18
Diphtheria	12
Influenza	15
Malaria	1
Measles	32
Mumps	4
Pneumonia	9
Scarlet fever	32
Septic sore throat	1
Smallpox	17
Tuberculosis	[1] 3
Typhoid fever	1
Whooping cough	1

SOUTH DAKOTA

	Cases
Cerebrospinal meningitis	1
Chicken pox	19
Diphtheria	1
Influenza	1
Measles	35
Pneumonia	1
Scarlet fever	27
Smallpox	4
Whooping cough	1

UTAH

	Cases
Chicken pox	10
Diphtheria	2
German measles	3
Measles	179
Mumps	19
Pneumonia	6
Scarlet fever	4

VERMONT

	Cases
Chicken pox	16
Measles	23
Mumps	16
Scarlet fever	4
Whooping cough	24

WASHINGTON

	Cases
Cerebrospinal meningitis	1
Chicken pox	110
Diphtheria	23
German measles	17
Measles	117
Mumps	30
Scarlet fever	91
Smallpox	38
Tuberculosis	4
Typhoid fever	4
Whooping cough	2

WEST VIRGINIA

	Cases
Chicken pox	101
Diphtheria	33
Influenza	30
Measles	103
Scarlet fever	59
Smallpox	1
Tuberculosis	13
Typhoid fever	16
Whooping cough	69

Reports for Week Ended December 18, 1926

NORTH DAKOTA

	Cases
Chicken pox	24
Diphtheria	7
Measles	361
Mumps	10
Pneumonia	5
Scarlet fever	54
Smallpox	1
Tuberculosis	4
Typhoid fever	1
Whooping cough	2

[1] Deaths.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of monthly State reports is published weekly and covers only those States from which reports are received during the cu. rent week:

State	Cerebrospinal meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
July, 1926										
Massachusetts	8	174	9	4	917	4	21	628	0	46
October, 1926										
Texas	6	180	57	1,392			0	81		160
November, 1926										
Illinois	12	581	80	5	1,368	0	12	1,124	25	202
Iowa	3	132			82		1	220	27	12
Louisiana	4	180	61	57	52	19	2	87	14	57
Maryland	3	208	71	2	89	0	1	192	0	96
Michigan	0	711	15	1	325		7	962	90	49
Minnesota	1	430	9		511		0	1,054	23	15
New York	18	1,178		7	2,657		41	1,213	76	206
North Dakota	0	26	0		423		1	226	32	3
Ohio	6	1,333	23	1	134		7	1,387	132	159
Wisconsin	11	301	140		1,837		7	606	0	32
Wyoming	7	5	3		92		1	88	6	7

November, 1926

	Cases
Actinomycosis:	
Minnesota	1
Anthrax:	
New York	2
Chicken pox:	
Illinois	1,869
Iowa	299
Louisiana	14
Maryland	501
Michigan	1,212
Minnesota	1,121
New York	2,615
North Dakota	146
Ohio	2,376
Wisconsin	1,508
Wyoming	115
Dysentery:	
Illinois	23
Louisiana	5
Maryland	9
Michigan	1
Minnesota	4
New York	3
Wyoming	1
German measles:	
Illinois	30
Iowa	1
Maryland	11
New York	243
North Dakota	21
Ohio	9
Wisconsin	22
Hookworm disease:	
Louisiana	15
Minnesota	1
Impetigo contagiosa:	
Maryland	8
Lead poisoning:	
Illinois	22
Ohio	15

	Cases
Lethargic encephalitis:	
Illinois	6
Louisiana	1
Maryland	6
Michigan	6
Minnesota	4
New York	14
North Dakota	1
Ohio	4
Wisconsin	1
Mumps:	
Illinois	239
Iowa	21
Louisiana	2
Maryland	43
Michigan	132
New York	911
North Dakota	11
Ohio	207
Wisconsin	461
Wyoming	17
Ophthalmia neonatorum:	
Illinois	42
Iowa	1
Maryland	1
New York	2
Ohio	107
Paratyphoid fever:	
Illinois	3
Minnesota	1
New York	8
Ohio	2
Wyoming	1
Puerperal septicemia:	
Illinois	6
New York	9
Rabies in animals:	
Maryland	6

	Cases
Rabies in man:	
Ohio	1
Septic sore throat:	
Illinois	4
Maryland	14
Michigan	21
New York	12
Ohio	5
Wyoming	1
Tetanus:	
Illinois	2
Minnesota	1
New York	8
Trachoma:	
Iowa	1
Ohio	3
Tularæmia:	
Illinois	1
Typhus fever:	
Illinois	1
Maryland	1
Vincent's angina:	
Maryland	2
New York	59
Whooping cough:	
Illinois	958
Iowa	25
Louisiana	13
Maryland	298
Michigan	403
Minnesota	98
New York	1,352
North Dakota	23
Ohio	938
Wisconsin	910
Wyoming	55

RECIPROCAL NOTIFICATIONS

Notifications regarding communicable diseases sent during the month of November, 1926, to other State health departments by departments of health of certain States

Referred by—	Actinomycosis	Blastomycosis	Chicken pox	Diphtheria	Dysentery	Measles	Poliomyelitis	Smallpox	Tuberculosis	Typhoid fever
California									2	
Illinois								2	24	6
New Jersey										1
New York				3		2	1			6
Minnesota	1	1	1		3				28	1

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

Diphtheria.—For the week ended December 11, 1926, 39 States reported 2,143 cases of diphtheria. For the week ended December 12, 1925, the same States reported 1,679 cases of this disease. One hundred cities, situated in all parts of the country and having an aggregate population of more than 30,360,000, reported 1,169 cases of diphtheria for the week ended December 11, 1926. Last year for the corresponding week they reported 911 cases. The estimated expectancy for these cities was 1,350 cases. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

Measles.—Thirty-seven States reported 5,089 cases of measles for the week ended December 11, 1926, and 4,561 cases of this disease for the week ended December 12, 1925. One hundred cities reported 1,160 cases of measles for the week this year and 2,451 cases last year.

Poliomyelitis.—The health officers of 39 States reported 29 cases of poliomyelitis for the week ended December 11, 1926. The same States reported 41 cases for the week ended December 12, 1925.

Scarlet fever.—Scarlet fever was reported for the week as follows: Thirty-nine States—this year, 3,576 cases; last year, 3,203 cases; 100 cities—this year, 1,387 cases; last year, 1,280 cases; estimated expectancy, 1,062 cases.

Smallpox.—For the week ended December 11, 1926, 38 States reported 667 cases of smallpox. Last year for the corresponding week they reported 365 cases. One hundred cities reported smallpox for the week as follows: 1926, 65 cases; 1925, 119 cases; estimated expectancy, 69 cases. No deaths from smallpox were reported by these cities for the week this year.

Typhoid fever.—Three hundred and eighty-four cases of typhoid fever were reported for the week ended December 11, 1926, by 39 States. For the corresponding week of 1925 the same States reported 444 cases of this disease. Ninety-nine cities reported 61 cases of typhoid fever for the week this year and 111 cases for the corresponding week last year. The estimated expectancy for these cities was 87 cases.

Influenza and pneumonia.—Deaths from influenza and pneumonia were reported for the week by 94 cities, with a population of more than 29,600,000, as follows: 1926, 830 deaths; 1925, 799 deaths.

City reports for week ended December 11, 1926

The "estimated expectancy" given for diphtheria, poliomyelitis, scarlet fever, smallpox, and typhoid fever is the result of an attempt to ascertain from previous occurrence how many cases of the disease under consideration may be expected to occur during a certain week in the absence of epidemics. It is based on reports to the Public Health Service during the past nine years. It is in most instances the median number of cases reported in the corresponding week of the preceding years. When the reports include several epidemics or when for other reasons the median is unsatisfactory, the epidemic periods are excluded and the estimated expectancy is the mean number of cases reported for the week during nonepidemic years.

If reports have not been received for the full nine years, data are used for as many years as possible, but no year earlier than 1917 is included. In obtaining the estimated expectancy the figures are smoothed when necessary to avoid abrupt deviations from the usual trend. For some of the diseases given in the table the available data were not sufficient to make it practicable to compute the estimated expectancy.

Division, State, and city	Population July 1, 1925, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
NEW ENGLAND									
Maine:									
Portland	75,333	22	2	0	0	0	0	1	4
New Hampshire:									
Concord	22,546	0	1	0	0	0	26	0	0
Manchester	83,097	0	5	0	0	0	6	0	2
Vermont:									
Barre	10,008	3	0	0	0	0	21	0	1
Massachusetts:									
Boston	779,620	145	64	37	1	2	14	52	23
Fall River	128,993	5	5	4	1	0	1	4	0
Springfield	142,065	9	5	7	2	0	4	1	0
Worcester	190,757	27	5	0	0	1	1	3	9
Rhode Island:									
Pawtucket	69,760	6	2	5	0	0	0	0	0
Providence	267,918	0	10	8	0	0	1	0	7
Connecticut:									
Bridgeport	(1)	2	11	4	2	1	1	2	4
Hartford	160,197	6	9	3	0	0	0	0	5
New Haven	178,927	26	4	1	0	0	1	1	4

[1] No estimate made.

City reports for week ended December 11, 1926—Continued

Division, State, and city	Population July 1, 1925, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
MIDDLE ATLANTIC									
New York:									
Buffalo	538,016	27	26	16	--------	0	3	7	15
New York	5,873,356	237	227	194	77	16	18	172	157
Rochester	316,786	5	9	7	5	2	1	1	10
Syracuse	182,003	20	10	0	--------	0	18	8	0
New Jersey:									
Camden	128,642	8	6	18	0	0	0	1	0
Newark	452,513	25	20	12	6	0	1	8	9
Trenton	132,020	6	8	2	0	0	0	0	1
Pennsylvania:									
Philadelphia	1,979,364	165	85	48	1	5	3	21	62
Pittsburgh	631,563	100	29	22	1	1	2	2	23
Reading	112,707	13	5	3	--------	0	0	1	3
EAST NORTH CENTRAL									
Ohio:									
Cincinnati	409,333	35	20	12	0	3	1	24	10
Cleveland	936,485	103	47	101	2	5	8	0	22
Columbus	279,836	18	8	13	0	1	1	0	6
Toledo	287,380	81	17	9	0	0	8	0	5
Indiana:									
Fort Wayne	97,846	9	5	6	0	0	3	0	3
Indianapolis	358,819	62	13	22	0	0	1	0	16
South Bend	80,091	4	2	5	0	0	21	0	2
Terre Haute	71,071	6	3	0	0	0	0	0	1
Illinois:									
Chicago	2,995,239	201	148	52	13	5	184	65	47
Peoria	81,564	12	3	1	0	0	85	10	3
Springfield	63,923	20	2	4	0	0	68	0	3
Michigan:									
Detroit	1,245,824	121	72	82	1	5	6	28	24
Flint	130,316	25	14	4	0	0	1	0	3
Grand Rapids	153,698	15	6	0	1	1	0	0	3
Wisconsin:									
Kenosha	50,891	34	2	1	0	0	7	2	0
Madison	46,385	37	1	1	0	0	16	0	0
Milwaukee	509,192	88	30	22	1	0	10	51	11
Racine	67,707	27	3	2	0	0	0	5	0
Superior	39,671	1	1	1	0	0	0	0	0
WEST NORTH CENTRAL									
Minnesota:									
Duluth	110,502	10	2	0	0	0	38	0	1
Minneapolis	425,435	198	26	33	0	2	0	0	8
St. Paul	246,001	33	21	3	0	0	7	0	12
Iowa:									
Davenport	52,469	2	2	0	0	--------	6	0	--------
Des Moines	141,441	0	6	1	0	--------	0	0	--------
Sioux City	76,411	17	3	1	0	--------	0	0	--------
Waterloo	36,771	44	1	0	0	--------	0	0	--------
Missouri:									
Kansas City	367,481	56	14	9	3	3	2	0	17
St. Joseph	78,342	3	4	1	0	0	0	0	5
St. Louis	821,543	49	59	44	1	2	8	5	--------
North Dakota:									
Fargo	26,403	4	0	0	0	0	3	0	2
Grand Forks	14,811	1	0	0	0	--------	29	0	--------
South Dakota:									
Aberdeen	15,036	25	1	0	0	--------	2	0	--------
Sioux Falls	30,127	1	0	0	0	--------	0	0	--------
Nebraska:									
Lincoln	60,941	9	2	0	0	0	2	0	2
Omaha	211,768	10	6	5	0	0	5	13	10
Kansas:									
Topeka	55,411	3	3	0	0	0	1	0	0
Wichita	88,367	25	8	0	0	0	0	1	1

City reports for week ended December 11, 1926—Continued

Division, State, and city	Population July 1, 1925, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
SOUTH ATLANTIC									
Delaware:									
Wilmington	122,049	2	4	1	0	0	1	0	1
Maryland:									
Baltimore	796,296	102	36	33	20	3	2	8	32
Cumberland	33,741	4	2	1	0	0	0	1	0
Frederick	12,035	12	1	1	0	0	0	0	0
District of Columbia:									
Washington	497,906	52	24	23	0	2	0	0	12
Virginia:									
Lynchburg	30,395	6	2	2	0	0	1	1	2
Norfolk	(1)	0	4	3	0	0	0	0	5
Richmond	186,403	3	13	17	0	2	9	1	4
Roanoke	58,208	2	4	4	0	2	0	0	2
West Virginia:									
Charleston	49,019	14	3	4	1	0	0	0	0
Huntington	63,485	0	2	1	0	0	0	0	1
Wheeling	56,208	14	3	3	0	0	0	1	2
North Carolina:									
Raleigh	30,371	6	2	3	0	0	0	0	1
Wilmington	37,061	8	1	2	0	0	0	0	1
Winston-Salem	69,031	2	2	6	0	0	0	0	4
South Carolina:									
Charleston	73,125	0	2	0	15	1	0	0	3
Columbia	41,225	3	1	1	0	0	1	0	0
Greenville	27,311	8	0	2	0	0	0	0	1
Georgia:									
Atlanta	(1)	4	5	18	22	6	7	0	5
Brunswick	16,809	4	0	0	0	0	0	0	0
Savannah	93,134	1	2	1	14	2	0	0	5
Florida:									
Miami	69,754	6	--------	2	1	0	1	0	3
St. Petersburg	26,847	--------	1	--------	--------	0	--------	--------	1
Tampa	94,743	1	2	2	0	0	8	0	2
EAST SOUTH CENTRAL									
Kentucky:									
Covington	58,309	--------	3	--------	--------	--------	--------	--------	--------
Louisville	305,935	14	13	8	1	2	1	0	12
Tennessee:									
Memphis	174,533	13	10	6	0	3	8	0	6
Nashville	136,220	3	5	14	0	0	0	0	5
Alabama:									
Birmingham	205,670	18	6	11	7	3	0	2	6
Mobile	65,955	0	2	3	0	0	6	0	2
Montgomery	46,481	15	1	8	0	0	0	0	0
WEST SOUTH CENTRAL									
Arkansas:									
Fort Smith	31,643	0	2	5	0	--------	0	5	--------
Little Rock	74,216	4	2	1	0	--------	1	0	2
Louisiana:									
New Orleans	414,493	1	12	13	10	6	30	0	13
Shreveport	57,857	10	1	4	0	0	1	5	4
Oklahoma:									
Oklahoma City	(1)	0	3	0	0	0	0	0	3
Texas:									
Dallas	194,450	4	12	21	1	1	0	0	2
Galveston	48,375	0	1	0	0	0	0	0	3
Houston	164,954	5	5	8	0	1	0	0	5
San Antonio	198,069	0	4	10	0	1	2	0	5
MOUNTAIN									
Montana:									
Billings	17,971	2	0	0	0	0	39	0	0
Great Falls	29,883	14	0	0	0	1	3	0	0
Helena	12,037	0	0	0	0	0	1	0	0
Missoula	12,668	2	0	1	0	0	0	3	0
Idaho:									
Boise	23,042	4	0	0	0	0	11	0	0

1 No estimate made.

City reports for week ended December 11, 1926—Continued

Division, State, and city	Population July 1, 1925, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
MOUNTAIN—continued									
Colorado:									
Denver	280,911	15	13	15		3	20	0	7
Pueblo	43,787	6	5	0	0	0	0	0	0
New Mexico:									
Albuquerque	21,000	4	1	0	0	0	5	1	0
Arizona:									
Phoenix	38,669	0	0	0	0	0	0	0	2
Utah:									
Salt Lake City	130,948	25	4	10	0	0	209	1	5
Nevada:									
Reno	12,665	1	0	1	0	0	0	0	0
PACIFIC									
Washington:									
Seattle	[1]	55	7	9	0		9	27	
Spokane	108,897	38	5	1	0		97	36	
Tacoma	104,455	14	3	7	0	0	0	0	2
Oregon:									
Portland	282,383	11	10	13	0	0	6	1	10
California:									
Los Angeles	[1]	80	37	56	23	3	13	10	25
Sacramento	72,260	7	3	2	0	0	33	22	3
San Francisco	557,530	32	19	14	2	0	77	38	2

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
NEW ENGLAND											
Maine:											
Portland	2	3	0	0	0	0	0	0	0	21	29
New Hampshire:											
Concord	0	4	0	0	0	0	0	0	0	0	13
Manchester	2	3	0	0	0	1	0	0	0	0	16
Vermont:											
Barre	1	0	0	0	0	1	0	0	0	1	4
Massachusetts:											
Boston	43	78	0	0	0	15	1	0	0	33	226
Fall River	2	1	0	0	0	4	1	0	0	0	26
Springfield	8	8	0	0	0	0	0	0	0	1	23
Worcester	11	16	0	0	0	4	0	0	0	4	42
Rhode Island:											
Pawtucket	1	1	0	0	0	0	0	0	0	2	15
Providence	6	5	0	0	0	1	1	0	0	5	57
Connecticut:											
Bridgeport	7	20	0	0	0	0	0	0	0	4	29
Hartford	6	6	0	0	0	1	1	0	0	1	33
New Haven	7	2	0	0	0	1	1	1	0	0	37
MIDDLE ATLANTIC											
New York:											
Buffalo	22	15	1	0	0	9	2	0	1	8	116
New York	153	201	0	2	0	91	18	14	3	40	1,484
Rochester	12	14	0	0	0	5	1	14	4	4	96
Syracuse	12	15	0	0	0	1	1	0	0	9	44
New Jersey:											
Camden	3	5	0	0	0	1	0	1	0	0	34
Newark	16	26	0	0	0	5	1	2	0	26	114
Trenton	3	1	0	0	0	5	1	0	0	5	35
Pennsylvania:											
Philadelphia	66	66	0	0	0	30	4	4	0	39	521
Pittsburgh	36	12	0	0	0	6	1	0	0	10	148
Reading	1	1	0	0	0	0	0	1	0	6	30

[1] No estimate made.

[2] Pulmonary tuberculosis only.

City reports for week ended December 11, 1926—Continued

Division, State, and city	Scarlet fever: Cases, estimated expectancy	Scarlet fever: Cases reported	Smallpox: Cases, estimated expectancy	Smallpox: Cases reported	Smallpox: Deaths reported	Tuberculosis, deaths reported	Typhoid fever: Cases, estimated expectancy	Typhoid fever: Cases reported	Typhoid fever: Deaths reported	Whooping cough, cases reported	Deaths, all causes
EAST NORTH CENTRAL											
Ohio:											
Cincinnati	13	24	0	0	0	14	1	0	0	0	152
Cleveland	33	25	0	2	0	17	2	1	0	11	180
Columbus	12	14	0	0	0	2	0	0	0	0	82
Toledo	13	10	0	0	0	5	0	0	0	27	65
Indiana:											
Fort Wayne	2	1	0	0	0	3	1	1	0	0	22
Indianapolis	12	17	4	7	0	7	0	1	0	10	107
South Bend	3	4	0	0	0	2	0	0	0	0	12
Terre Haute	3	3	0	0	0	1	0	0	0	0	17
Illinois:											
Chicago	117	100	1	0	0	38	7	1	0	50	657
Peoria	6	0	0	0	0	0	0	0	0	3	27
Springfield	2	1	0	0	0	1	1	0	0	9	23
Michigan:											
Detroit	85	96	2	0	0	23	3	1	2	52	290
Flint	8	21	0	1	0	2	1	0	0	4	30
Grand Rapids	8	12	0	0	0	0	1	0	0	0	42
Wisconsin:											
Kenosha	1	5	1	0	0	0	0	0	0	9	5
Madison	2	6	0	0	0	0	0	0	0	0	5
Milwaukee	26	18	2	0	0	6	1	0	0	59	121
Racine	4	2	1	0	0	0	0	0	0	2	11
Superior	2	2	1	0	0	1	0	0	0	0	11
WEST NORTH CENTRAL											
Minnesota:											
Duluth	6	11	1	0	0	2	0	0	0	1	21
Minneapolis	47	79	4	0	0	1	1	0	0	2	99
St. Paul	20	28	10	2	0	1	1	1	0	5	55
Iowa:											
Davenport	1	2	1	0	--------	--------	0	0	--------	0	--------
Des Moines	7	1	0	0	--------	--------	0	0	--------	0	1
Sioux City	3	10	1	2	--------	--------	0	0	--------	2	--------
Waterloo	3	1	0	0	--------	--------	0	0	--------	2	--------
Missouri:											
Kansas City	11	23	0	2	0	10	1	0	0	2	97
St. Joseph	3	2	0	0	0	2	0	0	0	0	28
St. Louis	34	30	0	1	0	4	2	1	0	25	237
North Dakota:											
Fargo	2	0	0	0	0	0	0	0	0	0	6
Grand Forks	0	0	1	0	--------	--------	0	0	--------	0	--------
South Dakota:											
Aberdeen	1	18	0	0	--------	--------	0	0	--------	4	--------
Sioux Falls	2	0	1	0	--------	--------	0	0	--------	0	--------
Nebraska:											
Lincoln	2	4	0	0	0	0	0	0	0	0	16
Omaha	5	11	4	0	0	1	1	0	0	0	49
Kansas:											
Topeka	2	2	0	12	0	0	0	0	0	2	10
Wichita	3	8	0	0	0	1	0	0	1	0	23
SOUTH ATLANTIC											
Delaware:											
Wilmington	3	18	0	0	0	1	1	0	0	1	30
Maryland:											
Baltimore	23	22	1	0	0	14	3	3	0	53	216
Cumberland	0	1	1	0	0	0	1	1	0	4	10
Frederick	1	1	0	0	0	1	1	0	0	5	6
District of Columbia:											
Washington	20	8	0	0	0	9	4	1	1	8	136
Virginia:											
Lynchburg	0	7	0	0	0	0	0	0	0	0	15
Norfolk	2	0	0	0	0	2	0	1	0	3	--------
Richmond	6	6	0	0	0	3	1	1	0	0	59
Roanoke	1	4	0	1	0	1	1	0	0	0	20

City reports for week ended December 11, 1926—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
SOUTH ATLANTIC—continued											
West Virginia:											
Charleston	1	2	1	0	0	0	0	1	0	0	11
Huntington	1	1	0	0	0	3	0	0	0	0	13
Wheeling	2	0	0	0	0	0	1	1	0	5	16
North Carolina:											
Raleigh	1	1	0	0	0	1	0	0	0	20	14
Wilmington	0	0	0	0	0	1	0	0	0	2	11
Winston-Salem	2	3	1	0	0	1	0	0	0	4	17
South Carolina:											
Charleston	1	0	0	0	0	1	0	2	0	0	27
Columbia	0	0	0	0	0	0	0	0	0	0	-------
Greenville	0	1	0	0	0	0	0	0	0	4	5
Georgia:											
Atlanta	5	15	1	8	0	5	1	2	1	4	65
Brunswick	0	0	0	0	0	0	0	0	0	0	3
Savannah	1	2	1	1	0	2	1	0	0	1	26
Florida:											
Miami	-------	1	-------	0	0	0	-------	1	1	1	34
St. Petersburg	1	-------	0	-------	0	0	0	-------	0	-------	15
Tampa	0	2	0	0	0	2	0	0	1	0	26
EAST SOUTH CENTRAL											
Kentucky:											
Covington	2	-------	0	-------	-------	-------	0	-------	-------	-------	-------
Louisville	5	6	0	1	0	1	1	1	0	14	92
Tennessee:											
Memphis	5	11	0	1	0	2	1	5	1	32	53
Nashville	3	6	1	0	0	6	1	2	0	0	42
Alabama:											
Birmingham	4	4	1	0	0	4	2	0	0	4	54
Mobile	1	0	0	2	0	1	0	0	0	0	18
Montgomery	1	0	1	0	0	0	0	0	0	0	28
WEST SOUTH CENTRAL											
Arkansas:											
Fort Smith	1	0	0	0	-------	-------	0	0	-------	0	-------
Little Rock	2	1	0	0	-------	3	1	0	-------	0	-------
Louisiana:											
New Orleans	6	9	0	0	0	8	1	0	0	0	119
Shreveport	1	2	1	0	0	0	1	0	0	0	16
Oklahoma:											
Oklahoma City	3	1	0	0	0	2	0	0	0	0	27
Texas:											
Dallas	4	9	0	1	0	3	1	0	0	0	43
Galveston	0	7	0	0	0	0	0	1	0	0	12
Houston	2	4	1	1	0	9	0	0	0	0	63
San Antonio	1	1	0	0	0	9	1	2	0	0	55
MOUNTAIN											
Montana:											
Billings	1	0	0	0	0	0	0	0	0	0	7
Great Falls	2	3	1	0	0	0	0	0	0	0	6
Helena	0	1	0	0	0	0	0	0	0	0	-------
Missoula	1	5	1	0	0	0	0	0	0	0	7
Idaho:											
Boise	1	3	1	1	0	0	0	0	0	0	3
Colorado:											
Denver	10	73	4	0	0	13	0	0	1	1	83
Pueblo	2	1	1	0	0	0	0	1	0	0	15
New Mexico:											
Albuquerque	0	1	0	0	0	4	0	0	0	0	12
Arizona:											
Phoenix	2	0	0	0	0	8	0	0	1	0	21
Utah:											
Salt Lake City	3	2	2	1	0	1	0	0	0	0	34
Nevada:											
Reno	0	0	0	0	0	0	0	0	0	0	6

City reports for week ended December 11, 1926—Continued

Division, State, and city	Scarlet fever: Cases, estimated expectancy	Scarlet fever: Cases reported	Smallpox: Cases, estimated expectancy	Smallpox: Cases reported	Smallpox: Deaths reported	Tuberculosis, deaths reported	Typhoid fever: Cases, estimated expectancy	Typhoid fever: Cases reported	Typhoid fever: Deaths reported	Whooping cough, cases reported	Deaths, all causes
PACIFIC											
Washington:											
Seattle	7	8	3	0			0	2		0	
Spokane	6	24	3	2			1	0		9	
Tacoma	3	6	3	12	0	1	0	1	0	0	27
Oregon:											
Portland	7	24	6	5	0	7	0	1	0	0	87
California:											
Los Angeles	20	34	4	1	0	22	2	2	0	5	257
Sacramento	2	2	2	1	0	2	0	0	0	0	21
San Francisco	10	12	1	0	0	8	1	1	0	11	157

Division, State, and city	Cerebrospinal meningitis: Cases	Cerebrospinal meningitis: Deaths	Lethargic encephalitis: Cases	Lethargic encephalitis: Deaths	Pellagra: Cases	Pellagra: Deaths	Poliomyelitis (infantile paralysis): Cases, estimated expectancy	Poliomyelitis: Cases	Poliomyelitis: Deaths
NEW ENGLAND									
Massachusetts:									
Boston	1	0	0	0	0	0	1	0	0
Fall River	0	1	0	0	0	0	0	0	0
Rhode Island:									
Pawtucket	0	0	0	0	0	0	0	1	0
Providence	0	0	0	0	0	0	0	1	0
MIDDLE ATLANTIC									
New York:									
New York	4	0	3	2	0	1	2	1	1
Rochester	0	0	0	0	0	0	0	1	0
New Jersey:									
Newark	0	0	0	0	0	0	1	1	0
Pennsylvania:									
Pittsburgh [1]	0	1	0	0	0	0	0	0	0
EAST NORTH CENTRAL									
Ohio:									
Cleveland	1	0	0	0	0	0	0	1	0
Columbus	0	0	0	0	0	0	0	0	1
Illinois:									
Chicago	2	0	1	0	0	0	1	1	0
Michigan:									
Detroit	1	0	2	0	0	0	1	0	0
WEST NORTH CENTRAL									
Minnesota:									
Duluth	1	0	0	0	0	0	0	0	0
Missouri:									
St. Louis	2	1	0	0	0	0	0	0	0
SOUTH ATLANTIC									
Maryland:									
Baltimore	0	0	2	1	0	0	0	0	1
Virginia:									
Norfolk	0	0	1	0	0	0	0	0	0
North Carolina:									
Wilmington	0	0	0	0	0	1	0	0	0
South Carolina:									
Charleston	0	0	0	0	1	0	0	0	0
Georgia:									
Atlanta	0	0	0	0	1	0	0	0	0

[1] Rabies (human); 1 death at Pittsburgh, Pa.

City reports for week ended December 11, 1926—Continued

Division, State, and city	Cerebrospinal meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
EAST SOUTH CENTRAL									
Tennessee:									
Memphis	1	1	0	0	0	0	0	0	0
Nashville	0	0	0	0	0	0	0	1	0
Alabama:									
Birmingham	0	0	0	0	1	0	0	0	0
WEST SOUTH CENTRAL									
Louisiana:									
Shreveport	0	0	0	0	0	1	0	0	0
Texas:									
Galveston	0	0	0	0	0	1	0	0	0
MOUNTAIN									
Montana:									
Missoula	1	0	0	0	0	0	0	0	0
New Mexico:									
Albuquerque	0	0	0	0	0	0	0	1	1
PACIFIC									
Washington:									
Spokane	1	0	0	0	0	0	0	0	0
California:									
Los Angeles	0	0	0	0	0	0	0	1	0
San Francisco	0	0	1	0	0	0	1	1	0

The following table gives the rates per 100,000 population for 101 cities for the five-week period ended December 11, 1926, compared with those for a like period ended December 12, 1925. The population figures used in computing the rates are approximate estimates as of July 1, 1925 and 1926, respectively, authoritative figures for many of the cities not being available. The 101 cities reporting cases had an estimated aggregate population of nearly 30,000,000 in 1925 and nearly 30,500,000 in 1926. The 95 cities reporting deaths had more than 29,200,000 estimated population in 1925 and more than 29,730,000 in 1926. The number of cities included in each group and the estimated aggregate populations are shown in a separate table below.

Summary of weekly reports from cities, November 7 to December 11, 1926—Annual rates per 100,000 population, compared with rates for the corresponding period of 1925 [1]

DIPHTHERIA CASE RATES

	Week ended—									
	Nov. 14, 1925	Nov. 13, 1926	Nov. 21, 1925	Nov. 20, 1926	Nov. 28, 1925	Nov. 27, 1926	Dec. 5, 1925	Dec. 4, 1926	Dec. 12, 1925	Dec. 11, 1926
101 cities	169	229	176	230	154	212	165	[2] 225	159	[3] 201
New England	122	135	139	139	101	132	120	173	103	163
Middle Atlantic	140	162	143	159	150	154	137	176	138	160
East North Central	185	264	180	292	155	257	164	267	158	223
West North Central	235	222	221	213	170	191	272	[2] 221	239	193
South Atlantic	236	391	271	278	207	284	207	242	192	239
East South Central	63	265	121	368	110	218	116	301	121	[3] 275
West South Central	203	379	167	327	172	301	264	318	176	267
Mountain	240	182	305	146	129	200	231	228	166	246
Pacific	138	232	177	326	157	305	122	270	191	240

MEASLES CASE RATES

	Nov. 14, 1925	Nov. 13, 1926	Nov. 21, 1925	Nov. 20, 1926	Nov. 28, 1925	Nov. 27, 1926	Dec. 5, 1925	Dec. 4, 1926	Dec. 12, 1925	Dec. 11, 1926
101 cities	169	105	222	135	205	133	342	[2] 177	427	[3] 190
New England	903	31	1,000	47	798	57	1,526	102	1,963	165
Middle Atlantic	170	44	255	28	238	30	338	37	451	23
East North Central	84	100	97	121	118	131	243	145	293	218
West North Central	10	147	14	197	29	109	18	[2] 127	25	129
South Atlantic	217	24	271	54	330	23	516	49	539	54
East South Central	16	10	47	31	32	16	37	26	21	[3] 83
West South Central	9	26	9	26	4	103	4	142	4	146
Mountain	46	1,529	28	1,948	9	2,540	9	2,840	37	3,214
Pacific	19	280	30	491	25	340	55	704	52	617

SCARLET FEVER CASE RATES

	Nov. 14, 1925	Nov. 13, 1926	Nov. 21, 1925	Nov. 20, 1926	Nov. 28, 1925	Nov. 27, 1926	Dec. 5, 1925	Dec. 4, 1926	Dec. 12, 1925	Dec. 11, 1926
101 cities	182	207	178	213	197	215	211	[2] 242	223	[3] 238
New England	237	352	201	331	206	286	216	326	187	340
Middle Atlantic	142	125	143	129	149	137	166	156	172	177
East North Central	180	185	187	202	210	202	261	239	268	236
West North Central	354	346	401	407	438	411	405	[2] 459	476	431
South Atlantic	161	178	115	145	134	158	119	182	152	175
East South Central	168	296	126	228	168	239	163	244	110	[3] 149
West South Central	114	142	88	116	132	198	106	211	141	142
Mountain	170	701	157	637	166	783	240	929	157	801
Pacific	196	280	188	337	237	251	215	267	185	232

SMALLPOX CASE RATES

	Nov. 14, 1925	Nov. 13, 1926	Nov. 21, 1925	Nov. 20, 1926	Nov. 28, 1925	Nov. 27, 1926	Dec. 5, 1925	Dec. 4, 1926	Dec. 12, 1925	Dec. 11, 1926
101 cities	8	5	16	5	16	5	13	[2] 14	21	[3] 11
New England	0	0	0	0	0	0	0	0	0	0
Middle Atlantic	0	0	0	0	0	0	0	1	0	1
East North Central	13	10	31	3	31	7	13	21	33	7
West North Central	4	10	16	4	10	30	18	[2] 57	18	38
South Atlantic	6	2	19	4	2	4	4	19	8	19
East South Central	32	10	11	0	11	5	11	0	5	[3] 22
West South Central	0	30	0	4	9	4	13	9	9	9
Mountain	18	9	18	0	9	0	0	18	102	18
Pacific	41	5	75	49	94	5	105	35	124	43

[1] The figures given in this table are rates per 100,000 population, annual basis, and not the number of cases reported. Populations used are estimated as of July 1, 1925 and 1926, respectively.
[2] Kansas City, Mo., not included.
[3] Covington, Ky., not included.

Summary of weekly reports from cities, November 7 to December 11, 1926—Annual rates per 100,000 population, compared with rates for the corresponding period of 1925—Continued

TYPHOID FEVER CASE RATES

	Week ended—									
	Nov. 14, 1925	Nov. 13, 1926	Nov. 21, 1925	Nov. 20, 1926	Nov. 28, 1925	Nov. 27, 1926	Dec. 5, 1925	Dec. 4, 1926	Dec. 12, 1925	Dec. 11, 1926
101 cities	11	21	17	16	13	12	19	[2] 10	20	[4] 11
New England	2	9	31	7	17	7	22	7	22	2
Middle Atlantic	8	21	20	21	14	13	26	9	25	[5] 11
East North Central	9	10	3	5	3	4	8	6	12	3
West North Central	16	16	14	6	8	8	10	[2] 9	12	4
South Atlantic	10	36	29	23	27	19	19	17	23	24
East South Central	42	52	32	36	21	31	53	42	26	[3] 44
West South Central	57	34	31	13	31	17	40	9	31	13
Mountain	9	27	18	27	18	18	0	9	18	9
Pacific	3	30	6	30	14	22	14	16	14	16

INFLUENZA DEATH RATES

	Nov. 14, 1925	Nov. 13, 1926	Nov. 21, 1925	Nov. 20, 1926	Nov. 28, 1925	Nov. 27, 1926	Dec. 5, 1925	Dec. 4, 1926	Dec. 12, 1925	Dec. 11, 1926
95 cities	11	14	8	10	9	10	11	[2] 14	13	[3] 17
New England	7	2	2	2	12	9	10	7	10	9
Middle Atlantic	14	10	6	10	8	7	10	13	12	12
East North Central	10	10	6	10	5	9	6	9	11	14
West North Central	13	13	2	6	2	2	6	[2] 2	6	15
South Atlantic	2	17	13	8	10	15	17	21	8	34
East South Central	23	26	42	31	26	42	42	42	47	[3] 44
West South Central	29	71	10	33	34	33	39	43	44	43
Mountain	0	27	18	9	9	36	18	46	18	36
Pacific	4	14	18	4	4	0	4	11	4	11

PNEUMONIA DEATH RATES

	Nov. 14, 1925	Nov. 13, 1926	Nov. 21, 1925	Nov. 20, 1926	Nov. 28, 1925	Nov. 27, 1926	Dec. 5, 1925	Dec. 4, 1926	Dec. 12, 1925	Dec. 11, 1926
95 cities	132	106	146	123	126	126	144	[2] 123	130	[3] 129
New England	120	90	139	104	156	132	180	118	132	135
Middle Atlantic	143	114	160	135	145	138	161	150	132	139
East North Central	131	85	139	106	95	99	142	87	116	103
West North Central	81	76	101	120	81	74	54	[2] 72	84	118
South Atlantic	152	139	146	143	134	165	159	105	173	154
East South Central	163	166	221	171	179	104	131	135	184	[3] 171
West South Central	102	113	155	156	150	213	155	161	208	151
Mountain	176	155	222	109	157	146	157	209	176	109
Pacific	109	99	87	75	98	124	98	153	76	114

[2] Kansas City, Mo., not included.
[3] Covington, Ky., not included.
[4] Rochester, N. Y., and Covington, Ky., not included.
[5] Rochester, N. Y., not included.

Number of cities included in summary of weekly reports, and aggregate population of cities in each group, approximated as of July 1, 1925 and 1926, respectively

Group of cities	Number of cities reporting cases	Number of cities reporting deaths	Aggregate population of cities reporting cases		Aggregate population of cities reporting deaths	
			1925	1926	1925	1926
Total	101	95	29,900,058	30,427,598	29,221,531	29,733,613
New England	12	12	2,176,124	2,206,124	2,176,124	2,206,124
Middle Atlantic	10	10	10,346,970	10,476,970	10,346,970	10,476,970
East North Central	16	16	7,481,656	7,655,436	7,481,656	7,655,436
West North Central	12	10	2,550,024	2,589,131	2,431,253	2,468,448
South Atlantic	21	21	2,716,070	2,776,070	2,716,070	2,776,070
East South Central	7	7	993,103	1,004,953	993,103	1,004,953
West South Central	8	6	1,184,057	1,212,057	1,078,198	1,103,695
Mountain	9	9	563,912	572,773	563,912	572,773
Pacific	6	4	1,888,142	1,934,084	1,434,245	1,469,144

FOREIGN AND INSULAR

PLAGUE ON VESSEL

Steamship "Dacia"—At Haifa, Syria.—On November 17, 1926, a case of plague was reported on the steamship *Dacia* at Haifa, Syria, occurring in a seaman. The vessel came from Rumania.

BERMUDA

Leprosy—Care and treatment of patients.—Reports of leprosy in the island of Bermuda, received under date of December 10, 1926, show for September, 1925, 8 lepers present, 3 male, 5 female, and for September, 1926, 9 lepers, 3 male and 6 female; one man and one woman, white; the remaining cases, colored. The isolation hospital not being equipped for the treatment of these cases, the lepers are cared for mainly by the parishes in which they reside and where they are segregated. The treatment includes administration of chaulmestrol.

CANADA

Communicable diseases—Week ended December 4, 1926.—The Canadian Ministry of Health reports cases of certain communicable diseases in seven Provinces of Canada for the week ended December 4, 1926, as follows:

Disease	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	Total
Influenza	27							27
Smallpox				11	2	20	6	39
Typhoid fever	2	4	9	12	2	1	3	33

CHINA

Plague—Mongolia.—Information received under date of December 18, 1926, shows epidemic pneumonic plague present at Urga and Sanbese, Mongolia. Prophylactic measures were stated to have been put in force at Manchuria Station, on the South Manchuria Railway.

EGYPT

Plague—November 12–18, 1926.—During the week ended November 18, 1926, 1 case of plague, occurring in the district of Tantah, was reported in Egypt, making a total from January 1 to November 18, 1926, of 143 cases as compared with 137 cases reported for the corresponding period of 1925.

Alexandria—November 23, 1926.—On November 23, 1926, a case of bubonic plague was reported at Alexandria.

Gharbieh.—From November 22 to 23, 1926, 2 cases of plague with 1 death were reported at Tanta, Province of Gharbieh.

FRENCH SUDAN

Yellow fever—Segou—November 23, 1926.—Under date of November 23, 1926, a fatal case of yellow fever was reported at Segou, French Sudan, West Africa.

GREECE

Plague—Patras—November 9–13, 1926.—Three cases of plague have been reported at Patras, Greece, occurring November 9, 11, and 13, respectively.

Typhus fever.—During the month of October, 1926, 7 cases of typhus fever with 1 death were reported in Greece.

MADAGASCAR

Plague—October 1 to 15, 1926.—During the two weeks ended October 15, 1926, 121 cases of plague with 111 deaths were reported in the island of Madagascar. The occurrence was distributed according to provinces as follows: Maevatanana, cases 17, deaths 17; Majunga, cases 6, deaths 2; Moramanga, cases 18, deaths, 18; Tamatave, cases 1, deaths 1; Tananarive (town), cases 16; deaths 14; other localities, cases 63, deaths 59.

Deaths among Europeans.—Of the 14 deaths from plague reported in the town of Tananarive 3 deaths were in Europeans, making a total of 5 deaths of Europeans from plague since August ,1926.

MEXICO

Malaria—Vicinity of Vera Cruz.—Information received from Vera Cruz under date of December 8, 1926, shows malaria present at Palmar, a small locality in the vicinity of Vera Cruz, with 2 fatalities reported to November 10, 1926. A physician of the State medical service has been in charge of the situation since that date. It was stated that at the outset he treated daily from 100 to 120 cases of malaria, with a few cases of dysentery. Population of Palmar, 350, including residents of near-by ranches.

SENEGAL

Further relative to plague—November 22, 1926.—Under date of November 23, 1926, 2 new cases of bubonic plague were reported in the interior of Senegal, West Africa. The cases occurred in natives and in the district of Diourbel.

Yellow fever.—Yellow fever was reported in Senegal, November 23, 1926, as follows: Four cases with 4 deaths, 1 case occurring in the

district of Kolda (Casamance) and 3 cases in the district of Sine Saloum. Of these cases, 3 were in Syrians and 1 in a European.

UNION OF SOUTH AFRICA

Plague—Cape Province—October 31—November 6, 1926.—During the week ended November 6, 1926, a case of plague, occurring in a native on a farm in Colesberg district, was reported in the Cape Province, Union of South Africa.

Smallpox—Natal.—During the same period 7 additional cases of smallpox were reported at Durban, Natal, making a total of 49 cases with 9 deaths reported to date, occurring in Hindus or natives.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

The reports contained in the following tables must not be considered as complete or final as regards either the lists of countries included or the figures for the particular countries for which reports are given.

Reports Received During Week Ended December 31, 1926 [1]

CHOLERA

Place	Date	Cases	Deaths	Remarks
China:				
Amoy	Oct. 31-Nov. 6	1		
India:				
Calcutta	Oct. 24-30	18	11	
Rangoon	Oct. 31-Nov. 6	1	1	
Persia:				
Teheran	Aug. 23-Sept. 23	1		

PLAGUE

Place	Date	Cases	Deaths	Remarks
China:				
Mongolia—				
Sanbese	Dec. 18			Epidemic pneumonic.
Urga	do			Do.
Egypt				Jan. 1-Nov. 18, 1926: Cases, 143. Corresponding period, 1925: Cases, 137.
Garbieh Province	Nov. 22-28	2	1	
Tantah District	Nov. 12-18	1		
City—				
Alexandria	Nov. 23	1		
Greece:				
Patras	Nov. 9-13	3		
India:				
Madras Presidency	Oct. 17-23	97	55	
Rangoon	Oct. 31-Nov. 6	3	4	
Java:				
Batavia	do	5	4	Province.
Madagascar				Oct. 1-15, 1926: Cases, 121; deaths, 111.
Maevatanana	Oct. 1-15	17	17	Bubonic, pneumonic, septicemic.
Majunga	do	6	2	Bubonic.
Moramanga	do	18	18	Bubonic, septicemic.
Tamatave	do	1	1	Bubonic.
Tananarive (Town)	do	16	14	Bubonic, pneumonic, septicemic. Of the deaths, 3 were in Europeans; total European deaths of plague from August, 1926, 5.
Other localities	do	63	59	Bubonic, pneumonic, septicemic.
Senegal	Nov. 23	2		
Union of South Africa:				
Cape Province—				
Colesberg District	Oct. 31-Nov. 6	1		
On vessel:				
Steamship Dacia	Nov. 17	1		At Haifa, Syria. Seaman on Rumanian steamship.

[1] From medical officers of the Public Health Service, American consuls, and other sources.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received During Week Ended December 31, 1926—Continued

SMALLPOX

Place	Date	Cases	Deaths	Remarks
Algeria:				
Algiers	Nov. 1-10	1		
Constantine	Nov. 24	44		Eastern department.
Brazil:				
Bahia	Oct. 24-30	6	2	
British South Africa:				
Northern Rhodesia	Oct. 30-Nov. 5	1		
Canada:				
Alberta	Nov. 28-Dec. 4	6		
Manitoba	do	2		
Ontario	do	11		
Toronto	Dec. 5-11	3		
Saskatchewan	Nov. 28-Dec. 4	20		
France:				
Paris	Nov. 11-20	4	1	
India:				
Calcutta	Oct. 24-30	4	4	
Madras	Nov. 7-13	3		
Java:				
Batavia	Oct. 31-Nov. 6	5		
Surabaya	Oct. 17-23	4	1	For East Java and Madura.
Mexico:				
Ciudad Juarez	Dec. 7-13	1		
Mexico City	Nov. 28-Dec. 4	2		Including municipalities in Federal District.
Torreon	Nov. 21-27		1	
Persia:				
Teheran	Aug. 23-Sept. 23		4	
Poland				Sept. 27-Oct. 9, 1926: One case.
Portugal:				
Lisbon	Nov. 21-27	5		
Union of South Africa:				
Natal—				
Durban	Oct. 10-Nov. 6	50	10	
Polela	Oct. 31-Nov. 6			Outbreak. In Nkandhla District.
Transvaal—				
Johannesburg	Nov. 7-13	1		

TYPHUS FEVER

Place	Date	Cases	Deaths	Remarks
Chosen:				
Seoul	Oct. 25-31	1		
Greece				Oct., 1926: Cases, 7; deaths, 1.
Ireland (Irish Free State):				
Ennistymon	July 4-10	5		
Mexico:				
Mexico City	Nov. 28-Dec. 4	10		Including municipalities in Federal district.
Palestine:				
Haifa	Nov. 9-15	1		
Persia:				
Teheran	Aug. 23-Sept. 23		2	
Poland	Sept. 27-Oct. 16	52	5	
Krakow	Oct. 17-23	31	5	
Union of South Africa:				
Cape Province—				
Alexandria District	Oct. 31-Nov. 6			Outbreak. In one locality.

YELLOW FEVER

Place	Date	Cases	Deaths	Remarks
French Sudan:				
Segou	Nov. 23	1	1	
Senegal				Nov. 23, 1926: Cases, 4; deaths, 4. One European.
Kolda District	Nov. 23	1	1	
Sine Saloum	do	3	3	

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received From June 26 to December 31, 1926 [1]

CHOLERA

Place	Date	Cases	Deaths	Remarks
Ceylon				Apr. 18–May 29, 1926: Cases, 31; deaths, 29.
China:				
Amoy	Aug. 8–Nov. 6	275		
Antung	Aug. 1–31	500		
Canton	June 1–30	38	14	
Do	July 15–31	54	28	
Do	Aug. 25–31	30	8	
Changsha	Oct. 3–16	2		
Foochow	Aug. 15–Oct. 2		1	In foreign population.
Kulangsu	Sept. 12–18		2	
Manchuria—				
Changshun	Aug. 1–31	320		
Dairen	do	10	1	
Harbin	Aug. 5–Sept. 12	280	83	
Newchwang	Aug. 1–31	167		
Nanking	July 25–Oct. 2			Present.
Shanghai	Reported July 20	35	8	
Do	July 25–Oct. 23	43	420	Cases, foreign; deaths, native and foreign.
Swatow	July 11–Oct. 16	50	63	
Tsingtao	July 11–Aug. 30	4	4	Japanese settlements, 10 deaths; Chinese, 30 to 40 deaths daily, estimated.
Do	Oct. 10–30			Present.
Chosen:				
North Heian Province	Sept. 3–16	70	30	Deaths estimated.
Shingishu	Sept. 13	19		Including places in vicinity.
French Settlements in India	Mar. 7–June 26	31	30	
Do	June 27–Aug. 28	94	83	
India				Apr. 25–June 26, 1926: Cases, 18,526; deaths, 11,531. June 27–Oct. 9, 1926: Cases, 28,544; deaths, 17,966.
Bombay	May 30–June 5	1	1	
Do	July 18–Oct. 16	4	4	
Calcutta	Apr. 4–May 29	478	418	
Do	June 13–26	73	69	
Do	June 27–Oct. 30	366	320	
Madras	May 16–June 5	2	1	
Do	Aug. 1–Sept. 25	7	6	
Rangoon	May 9–June 26	67	44	
Do	June 27–Nov. 6	33	31	
Indo-China:				
Saigon	May 2–15	52	48	
Do	May 22–June 26	42	32	
Do	June 27–Aug. 14	31	17	
Japan				To Sept. 10, 1926: Cases, 35.
Ken (Prefecture)—				
Hiroshima	To Sept. 10	1		
Hyogo	do	7		
Kagakawa	do	8		
Kanagawa	do	3		Including Yokohama.
Kochi	do	1		
Ookayama	do	7		
Osaka	do	6		
Taihoku	Sept. 1–10	2		
Wakayama	To Sept. 10	2		
Taiwan Island	Sept. 21–Oct. 10	11		
Persia:				
Teheran	Aug. 23–Sept. 23	1		
Philippine Islands:				
Manila	Dec. 29, 1925–Oct. 30, 1926.	27	6	
Provinces—				
Albay	Apr. 18–24	1	1	
Davao	May 23–29	1		
Mindoro	Feb. 21–Mar. 6	3	3	
Pampanga	July 25–31	1	1	
Rizal	July 18–24	1		
Romblon	Dec. 14–31	42	43	
Do	Jan. 2–Mar. 27	41	35	
Siam				Apr. 1–Oct. 30, 1926: Cases, 7,705; deaths, 5,075.
Bangkok	May 2–June 12	1,325	786	
Do	June 20–26	56	26	
Do	June 27–Oct. 30	99	69	
Straits Settlements:				
Singapore	July 4–17	2	1	
On vessel:				
Steamship Macedonia	Aug. 5	7		At Yokohama, Japan. Vessel sailed from Singapore July 18, 1926.

[1] From medical officers of the Public Health Service, American consuls, and other sources.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from June 26 to December 31, 1926—Continued

PLAGUE

Place	Date	Cases	Deaths	Remarks
Algeria:				
Algiers	June 21-30	1		Under date of July 16, 2 cases reported.
Do	July 1-20	1		
Do	Sept. 23	1		
Bona	Aug. 14	1		
Oran	Sept. 21-Nov. 13	10	5	
Philippeville	Sept. 7	1		
Sfax	Nov. 13	7		
Argentina:				
Cordoba Province	Nov. 20	5		
Azores:				
Fayal Island—				
Horta	Aug. 2-29	2	2	
St. Michaels Island	May 9-June 26	4	1	
Do	June 27-July 10	3	1	
Brazil:				
Paranagua	Oct. 8			Present.
British East Africa:				
Kenya—				
Kisumu	May 16-22	1	1	
Do	Aug. 17-Sept. 11	3	2	
Uganda	Mar. 1-June 30	732	574	
Do	July 1-Aug. 31	312	267	
Canary Islands:				
Las Palmas	Nov. 2	3		Stated to be in locality removed from port.
Teneriffe	Aug. 2	2		
Ceylon:				
Colombo	May 29-June 5	1	1	
Do	Oct. 31-Nov. 6	1	1	Provisional diagnosis.
Chile:				
Iquique	June 20-26		1	
China:				
Amoy	Apr. 18-June 26	40	30	
Do	June 27-Aug. 7	28		
Foochow	June 6-July 31			Several cases. Not epidemic.
Mongolia—				
Sanbese	Dec. 18			Epidemic, pneumonic.
Urga	do			Do.
Nanking	May 9-Oct. 23			Prevalent.
Swatow	July 25-31	14		
Ecuador				January-June, 1926: Cases, 385; deaths, 154.
Chimborazo	January-June	9	2	Rats taken, 766.
Guayaquil	May 16-June 30	6		Rats taken, 30,914; found infected, 31.
Do	July 1-Oct. 31	19	3	Rats taken, 82,774; found infected, 115.
Leon	January-June	43	19	Localities, 2.
Loja	do	176	75	Cantons, 2.
Tungurahua	do	83	29	At Ambato, Huachi, and Picayhua. Rats taken, 1,542.
Egypt				Jan. 1-Nov. 18, 1926: Cases, 143.
City—				
Alexandria	July 27-Nov. 23	7	1	
Suez	May 21-July 1	9	5	
Do	July 29	2		
Provinces—				
Beheran	July 23-Aug. 15	4	1	
Beni-Suef	May 23-June 8	8	2	
Charkieh	July 27	1	1	
Gharbieh	June 2	1	1	
Do	Nov. 22-23	2	1	
Minieh	July 24	1	1	
Sidi Barrani	Sept. 30-Oct. 21	23	3	In western desert.
Tanta District	Oct. 22-Nov. 18	3		
France:				
Marseille	July 8	1	1	Reported July 24.
Paris	Oct. 18	1		
St. Denis	Reported Aug. 2	1		Vicinity of Paris.
St. Ouen	Aug. 14	2		Suburb of Paris.
Great Britain:				
Liverpool	Aug. 29-Sept. 4	2	1	
Greece:				
Athens	Apr. 1-May 31	16	4	Including Piræus.
Do	Aug. 1-Sept. 30	20	5	Do.
Patras	May 27-June 12	4	1	
Do	July 25-Nov. 13	12	5	
Zante	May 17	1		

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from June 26 to December 31, 1926—Continued

PLAGUE—Continued

Place	Date	Cases	Deaths	Remarks
Hawaii Territory:				
Hamakua	June 9			1 plague rodent trapped near Hamakua Mill.
Honokaa	Oct. 6	1	1	
Paauhau	July 18-24			Plague-infected rat trapped.
India				Apr. 25-June 16, 1926: Cases, 53,001; deaths, 41,576. June 27-Oct. 9, 1926: Cases, 10,028; deaths, 5,660.
Bombay	May 2-June 26	16	15	
Do	July 18-Oct. 9	13	12	
Karachi	May 23-June 26	15	13	
Do	July 11-17	1	1	
Madras Presidency	Apr. 25-June 26	162	93	
Do	July 4-Oct. 23	1,150	562	
Rangoon	May 9-June 26	20	15	
Do	June 27-Nov. 6	92	81	
Indo-China:				
Saigon	May 23-June 26	8	3	
Do	July 18-Aug. 7	2	1	
Iraq:				
Baghdad	Apr. 18-June 12	161	108	
Do	July 18-Sept. 11	4	4	
Japan:				
Yokohama	July 2-Aug. 10	9	8	
Java:				
Batavia	Apr. 24-June 19	65	65	
Do	June 20-Nov. 6	102	90	
Cheribon	Apr. 11-24	3	3	
Do	Sept. 12-18	1	1	
East Java and Madura	June 13-19	1	1	
Do	July 25-Oct. 16	1	2	
Surabaya	Aug. 22-Sept. 25	18	2	
Madagascar:				
Ambositra Province	May 1-15	4	4	Septicemic.
Antisirabi Province	June 16-30	4	4	
Itasy Province	do	17	10	
Do	Aug. 16-Sept. 30	8	8	
Maevatanana Province	Aug. 16-Oct. 15	19	19	
Majunga Province	June 16-30	10	6	
Do	Aug. 16-Oct. 15	72	58	
Mananjary Province	do	1	1	
Moramanga Province	Apr. 1-15	2	2	
Do	Sept. 1-Oct. 15	49	49	
Tamatave Province	Aug. 16-Oct. 15	21	16	
Tananarive Province				Apr. 1-June 30, 1926: Cases, 130, deaths, 120. July 1-Oct. 15, 1926: Cases, 276; deaths, 262.
Towns—				
Majunga	Aug. 1-15	14	10	
Tamatave (port)	May 16-31	1	1	
Do	July 1-Aug. 15	6	5	
Tananarive	Apr. 1-June 30	7	7	
Do	July 1-Oct. 15	48	45	
Mauritius:				
Port Louis	July 31	1	1	
Nigeria				Feb. 1-June 30, 1926: Cases, 191; deaths, 163. July 1-31, 1926; Cases, 121; deaths, 112.
Peru				May-June, 1926: Cases, 57; deaths, 16. July 1-Oct. 31, 1926: Cases, 125; deaths, 65
Departments—				
Ancash	May 1-31			Present.
Do	July 1-Sept. 30	2		
Cajamarca	May 1-June 30	10	4	
Do	Aug. 1-Oct. 31	1		
Ica	May 1-31	1		
Do	July 1-31	1		
Junin	Sept. 1-30	21	20	
Lambayeque	Sept. 1-Oct. 31	5	2	
Libertad	May 1-31	4		
Do	Sept. 1-Oct. 31	11	2	
Lima	May 1-June 30	29	12	
Do	July 1-Oct. 31	82	40	
Piura	June 1-30	13		
Do	Oct. 1-31	2	1	
Russia				Jan. 1-Mar. 31, 1926: Cases, 37.
Senegal				Nov. 1-30, 1925: Cases, 3; deaths, 2. Mar. 1-June 30, 1926: Cases, 342; deaths, 213. Nov. 1-23, 1926: Cases, 57; deaths, 27.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from June 26 to December 31, 1926—Continued

PLAGUE—Continued

Place	Date	Cases	Deaths	Remarks
Siam				Apr. 1-Oct. 30, 1926: Cases, 15; deaths, 10.
Bangkok	May 23-June 26	2	2	
Do	July 18-24	1	1	
Straits Settlements:				
Singapore	May 2-8	1	1	
Do	July 4-17	1	1	
Syria:				
Beirut	July 1-Aug. 10	2		
Do	Oct. 15-20	3		
Tunisia	May 11-June 30	174		
Do	July 1-Aug. 20	13		
Do	Reported Nov. 27	57		
Kairouan	June 9	3		9 cases 30 miles south of Kairouan.
Turkey:				
Constantinople	Aug. 1-Sept. 25	7	4	
Union of South Africa:				
Cape Province	May 16-22	5	3	
Do	Oct. 17-23	4	3	
Calvinia District	June 13-26	12	6	
Do	June 27-Aug. 21	3	3	
Colesberg District	Oct. 31-Nov. 6	1		
Hanover District	Oct. 10-16	1	1	Native. On farm.
Kimberley District	Oct. 17-23	2	2	European.
Williston District	June 13-26	2		
Do	June 27-July 3	1		
Do	Oct. 17-30	4	3	
Orange Free State—				
Hoopstad District	Aug. 15-21	1		
Protestpan	May 9-22	3	3	
On vessel:				
Steamship Zaria	September, 1926	2	2	At Liverpool, England, from Lagos, Nigeria, West Africa; 29 plague-infected rats found on board.
Steamship Dacia	Nov. 17	1		At Haifa, Syria. Seaman on Rumanian steamship.

SMALLPOX

Place	Date	Cases	Deaths	Remarks
Algeria				July 21-Sept. 20, 1926: Cases, 230.
Algiers	May 21-June 30	14		
Do	July 1-Nov. 10	4		
Constantine	Nov. 24	44		Eastern department.
Arabia:				
Aden	Oct. 3-9	1		Imported.
Belgium				Sept. 1-30, 1926: Cases, 2.
Antwerp	Aug. 1-7	1	1	
Bolivia:				
La Paz	May 1-June 30	14	7	
Do	July 1-Aug. 31	16	8	
Brazil:				
Bahia	June 20-26	1		
Do	June 27-Oct. 30	82	43	
Manaos	Apr. 1-30		5	
Para	May 16-June 26	26	25	
Do	June 27-Oct. 30	38	27	
Pernambuco	July 11-Oct. 16	236	26	
Porto Alegre	Aug. 10-31	2		
Rio de Janeiro	May 2-June 19	132	91	
Do	July 4-Sept. 25	2,534	1,338	
Do	Oct. 3-Nov. 13	475	300	Jan. 1-Oct. 16, 1926: Cases, 3,601; deaths, 1,896.
Sao Paulo	June 27-Aug. 22		5	
Santos	Mar. 1-7		1	
British East Africa:				
Mombasa	July 5-11	5	4	
Tanganyika	May 1-31	252	46	
Do	Aug. 29-Sept. 18	7		
Uganda	Mar. 1-May 31	3		
Do	Aug. 1-31	1		
British South Africa:				
Northern Rhodesia	May 18-24	17	6	Natives.
Do	June 8-14	5		
Do	Sept. 11-Nov. 5	2		

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from June 26 to December 31, 1926—Continued

SMALLPOX—Continued

Place	Date	Cases	Deaths	Remarks
Canada				May 30-June 26, 1926: Cases, 70. June 27-Dec. 4, 1926: Cases, 571.
Alberta				May 30-June 12, 1926: Cases, 3.
Calgary	Sept. 5-Nov. 27	50		June 27-Dec. 4, 1926: Cases, 92.
British Columbia—Vancouver	Aug. 16-Sept. 12	3		
Manitoba				May 30-June 26, 1926: Cases, 15. June 27-Dec. 4, 1926: Cases, 90.
Winnipeg	June 6-12	5		
Do	July 4-Dec. 11	18		
New Brunswick				Oct. 31-Nov. 6, 1926: 1 case.
Northumberland County.	Oct. 11-23	1		
Ontario				May 30-June 26, 1926: Cases, 36. June 27-Dec. 4: Cases, 223.
Fort William	July 25-Aug. 7	2		
Kingston	May 23-June 26	5		
Do	July 11-Nov. 6	3		
Kitchener	Apr. 26-May 29	3	1	
North Bay	May 2-22	5		
Do	July 25-31	2		
Orillia	Apr. 26-May 29	7		
Ottawa	July 18-24	1		
Do	Nov. 28-Dec. 4	1		
Packenham	do	10		
Peterboro	Sept. 1-30	10		
Toronto	July 18-Dec. 11	49		
Waterloo	July 18-24	6		
Saskatchewan				May 30-June 26, 1926: Cases, 16. June 27-Dec. 4: Cases, 165.
Regina	July 4-Sept. 25	3		
Ceylon				Mar. 14-May 29, 1926: Cases, 44; deaths, 3. Sept. 12-18, 1926: Cases, 2.
Colombo	Sept. 19-Oct. 16	7		
Chile:				
Antofagasta	June 6-12	1		
China:				
Amoy	May 1-June 26	4	8	
Do	July 4-10	1		
Antung	May 17-June 19	5		
Do	July 4-18	2		
Canton	May 1-31	4	2	
Do	Sept. 1-30	1		
Changsha	Aug. 8-14	1		
Chungking	May 2-Oct. 23			Present.
Foochow	May 2-Oct. 30			Do.
Fushun	Sept. 12-18	1		
Hongkong	May 2-June 26	19	10	
Do	June 27-July 3	1	1	
Manchuria	July 4-31	18		Railway stations.
An-shan	May 16-June 12	5		South Manchurian Railway.
Antung	May 16-June 19	5		
Changchun	May 16-June 26	6		Do.
Do	June 27-Sept. 11	2		Do.
Dairen	Apr. 26-June 20	69	16	
Do	June 28-Aug. 8	5	3	
Fushun	May 16-June 5	4		Do.
Harbin	May 14-June 30	21		Do.
Do	July 1-28	12		
Kai-yuan	May 16-June 30	10		Do.
Kungchuling	June 13-19	1		Do.
Liaoyang	May 16-June 30	4		Do.
Mukden	do	4		Do.
Penhsihu	May 16-June 19	4		Do.
Do	Aug. 8-Oct. 3	3		Do.
Ssupinghai	May 16-June 30	2		Do.
Do	Aug. 1-7	1		Do.
Teshihchiao	May 16-June 30	2		Do.
Tieh-ling	Sept. 27-Oct. 3	1		
Wa-feng-tien	do	3		Do.
Do	Aug. 1-7	1		Do.
Nanking	May 8-Oct. 30			Present.
Shanghai	May 2-June 26	10	25	Cases, foreign: Deaths, population of international concession, foreign and native.
Do	June 27-July 24	3	3	
Do	Oct. 3-9	1		
Swatow	May 9-Oct. 30			Sporadic.
Tientsin	June 2-26		1	Reported by British municipality.
Wanshien	May 1			Prevalent.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from June 26 to December 31, 1926—Continued

SMALLPOX—Continued

Place	Date	Cases	Deaths	Remarks
Chosen				Mar. 1-June 30, 1926: Cases, 667; deaths, 146. July 1-31, 1926: Cases, 82; deaths, 27.
Fusan	May 1-31	1		
Seishun	do	2	1	
Egypt:				
Alexandria	May 15-July 1	18	3	
Do	July 23-Oct. 28	15	7	
Cairo	Jan. 29-June 10	56	14	
Estonia				May 1-June 30, 1926: Cases, 3.
France				Mar. 1-June 30, 1926: Cases, 141. July 1-Aug. 31: Cases, 24.
Paris	Sept. 1-Nov. 20	69	19	
St. Etienne	Apr. 18-June 15	7	3	
Do	Sept. 16-30	2	1	
French Settlements in India	Mar. 7-June 26	282	282	
Do	June 27-Aug. 28	68	68	
Germany:				
Coblenz	Oct. 24-30	1		
Gold Coast	Mar. 1-June 30	671		
Do	July 1-31	20	1	
Great Britain:				
England and Wales				May 23-June 26, 1926: Cases, 933; June 27-Nov. 13, 1926: Cases, 2,415.
Birmingham	Sept. 26-Oct. 2	1		
Bradford	May 23-29	1		
Do	Aug. 29-Sept. 4	1		
Hull	Oct. 17-23	1		
London	Sept. 26-Oct. 23	4		
Newcastle-on-Tyne	June 6-12	1		
Do	July 11-Nov. 30	7		At Gateshead, several cases reported.
Nottingham	May 2-June 5	7		
Do	July 18-24	1		
Sheffield	June 13-19	1		
Do	July 4-Nov. 27	49		
South Shields	Oct. 3-9	1		
Stoke-on-Trent	Nov. 7-13	1		
Greece:				
Athens	July 1-31	71	6	Including Piræus.
Saloniki	June 1-14		3	
Guatemala:				
Guatemala City	June 1-30		2	
India				Apr. 25-June 26, 1926: Cases, 54,851; deaths, 14,771. June 27-Oct. 9, 1926: Cases, 27,840; deaths, 8,445.
Bombay	May 2-June 26	220	134	
Do	June 27-Nov. 6	137	75	
Calcutta	Apr. 4-May 20	171	152	
Do	June 13-26	24	18	
Do	June 27-Oct. 30	53	47	
Karachi	May 6-June 26	44	18	
Do	June 27-Oct. 30	15	7	
Madras	May 16-June 26	7	4	
Do	June 27-Nov. 13	83	21	
Rangoon	May 9-June 26	10	5	
Do	July 4-Sept. 23	21	5	
Indo-China:				
Saigon	May 9-June 26	2		
Iraq:				
Baghdad	do	8	3	
Do	July 4-Sept. 11	3	1	
Basra	Apr. 18-June 22	34	25	
Do	Aug. 15-21	1		
Italy				Mar. 28-June 26, 1926: Cases, 34. June 27-Aug. 7, 1926: Cases, 12.
Catania	Aug. 9-15	2		
Rome	June 14-20	4		Entire consular district, including island of Sardinia.
Do	Aug. 30-Sept. 5	2		Do.
Jamaica				Apr. 25-June 26, 1926: Cases—201. (Reported as alastrim.)
Do				June 27-Nov. 27, 1926: Cases, 347. (Reported as alastrim.)
Japan				Apr. 11-June 26, 1926: Cases, 658. June 27-Aug. 28, 1926: Cases, 70.
Kobe	May 30-June 5	1		
Nagoya	May 16-June 22		1	
Do	July 4-10	1		
Taiwan Island	May 11-20	24		
Do	June 1-20	23		
Do	July 11-Aug. 10	2		
Tokyo	June 26-July 17	3		
Yokohama	May 2-8	2		

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from June 26 to December 31, 1926—Continued

SMALLPOX—Continued

Place	Date	Cases	Deaths	Remarks
Java:				
Batavia	May 15-June 25	2		Province.
Do	July 24-Nov. 6	22		
East Java and Madura	Apr. 11-July 3	100	6	
Do	July 4-Oct. 23	79	6	
Malang	Apr. 4-10	6	1	Interior.
Surabaya	May 16-22	14	1	
Do	July 18-Sept. 25	143	8	
Latvia				Apr. 1-June 30, 1926: Cases, 5.
Mexico				Feb. 1-June 30, 1926: Deaths, 1,525.
Aguascalientes	June 13-26		5	
Ciudad Jaurez	Dec. 7-13	1		
Guadalajara	June 8-14		2	
Do	June 29-Sept. 27		8	
Mexico City	May 16-June 5	3		Including municipalities in Federal district.
Do	July 25-Dec. 4	9		Do.
Saltillo	July 18-24		1	
San Antonio de Arenales	Jan. 1-June 30			Present: 100 miles from Chihuahua.
San Luis Potosi	June 13-26		7	
Do	July 4-Dec. 4		30	
Torreon	May 1-June 30		17	
Do	July 1-Nov. 27		17	
Netherlands:				
Amsterdam	July 18-24		9	
Nigeria				Feb. 1-June 30, 1926: Cases, 521; deaths, 49.
Persia:				
Teheran	Apr. 21-Sept. 23		18	
Peru:				
Arequipa	June 1-30		1	
Do	Sept. 1-Oct. 31			Present.
Poland				Mar. 28-May 1, 1926: Cases, 12; deaths, 1. June 27-Oct. 9, 1926: Cases, 417; deaths, 1.
Portugal:				
Lisbon	Apr. 26-June 19	10	3	
Do	July 11-Nov. 27	46	7	
Oporto	May 23-June 5	4		
Do	July 11-Nov. 6	3	1	
Russia				Jan. 1-Apr. 30, 1926: Cases, 2,529.
Siam				Apr. 1-Oct. 30, 1926: Cases, 628; deaths, 251.
Bangkok	May 2-June 12	23	20	
Do	July 4-Oct. 30	87	68	
Spain				Jan. 1-June 30, 1926: Deaths, 90.
Valencia	Aug. 22-Oct. 23	3		
Straits Settlements:				
Singapore	Apr. 25-May 1	1		
Do	July 11-17	1		
Sumatra:				
Medan	Aug. 22-28			1 case varioloid.
Switzerland:				
Lucerne Canton	June 1-30	1		
Do	July 1-Sept. 30	3		
Tripolitania	Apr. 1-June 30	12		
Tunisia				Apr. 1-June 30, 1926: Cases, 17. July 1-Sept. 30, 1926: Cases, 38.
Tunis	Sept. 11-30	2		
Union of South Africa	June 1-30	8	1	
Cape Province	June 20-26			Outbreaks.
Do	Aug. 15-Oct. 30			Do.
Idutya district	May 23-29			Do.
Natal	May 30-June 5			Do.
Durban	Oct. 10-Nov. 6	50	10	
Polela	Oct. 31-Nov. 6			Outbreak. In Nkandhla district.
Orange Free State	June 20-Aug. 28			Outbreak.
Transvaal				June 6-12, 1926: Outbreaks in Pietersburg and Rustenburg districts.
Do	Aug. 29-Sept. 4	1		Native.
Johannesburg	May 9-June 12	5		
Do	July 11-Nov. 13	5		
Praetoria	Sept. 19-25	1		
Yugoslavia				Apr. 15-30, 1926: Cases, 2; deaths, 1.
Zagreb	Aug. 9-15	2		

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from June 26 to December 31, 1926—Continued

SMALLPOX—Continued

Place	Date	Cases	Deaths	Remarks
On vessels:				
S. S. Karapara				At Zanzibar, June 7, 1926: 1 case of smallpox landed. At Durban, Union of South Africa, June 16, 1926: 1 suspect case landed.
Steamship	July 2	1		Vessel from Glasgow, Scotland, for Canada. Patient from Glasgow; removed at quarantine on outward voyage.

TYPHUS FEVER

Place	Date	Cases	Deaths	Remarks
Algeria				July 21-Sept. 20, 1926: Cases, 34; deaths, 1.
Algiers	May 21-June 30	7	1	
Do	July 21-Aug. 31	3		
Argentina:				
Rosario	Feb. 1, 28	2		
Bolivia:				
La Paz	June 1-30		1	
Do	Aug. 1-31	9	1	
Bulgaria				Mar. 1-June 30, 1926: Cases, 87; deaths, 14.
Chile:				
Antofagasta	May 23-June 26	4		
Do	June 27-July 3	1		
Concepcion	June 1-7		1	
Do	Oct. 1-31			Stated to be present in gaol.
Iquique	Aug. 8-Oct. 16	1	2	
Valparaiso	Apr. 29-May 5		1	
Do	Aug. 14-Nov. 6	11		
China:				
Antung	June 14-27	7	1	
Do	June 28-Oct. 31	45	1	
Canton	May 1-31	1		
Chungking	Aug. 29-Sept. 4			Present.
Ichang			1	Reported May 1, 1926. Occurring among troops.
Manchuria—				
Harbin	Oct. 14-20	1		
Wanshien				Present among troops May 1, 1926. Locality in Chungking consular district.
Chosen				Feb. 1-June 30, 1926: Cases, 1,005; deaths, 112. July 1-31, 1926: Cases, 37; deaths, 6.
Chemulpo	May 1-June 30	38		
Do	July 1-31	7	2	
Gensan	June 1-30	1		
Seoul	do	8	3	
Do	July 1-Oct. 31	9		
Czechoslovakia				Jan. 1-June 30, 1926: Cases, 156; deaths, 6.
Egypt:				
Alexandria	July 16-Aug. 19	3		
Do	Oct. 1-7	1	1	
Cairo	Jan. 29-May 13	89	27	
Do	July 23-Aug. 5	1		
Port Said	June 4-24	4	1	
Do	July 9-Oct. 7	5	1	
France	Aug. 1-31	5		
Great Britain:				
Scotland—				
Glasgow	July 30-Aug. 21	9	1	
Do	Reported Dec. 10	8		
Greece				Oct. 1-31, 1926: Cases, 7; deaths, 1.
Athens	Sept. 1-30		17	Including Piræus.
Hungary	May 1-June 30	3		
Iraq:				
Baghdad	Oct. 10-16	1		
Ireland (Irish Free State):				
Cork	June 5	1		
Cork County	Oct. 17-23	1		
Ennistymon	July 4-10	5		
Kerry County—				
Dingle	June 27-July 3	1		

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from June 26 to December 31, 1926—Continued

TYPHUS FEVER—Continued

Place	Date	Cases	Deaths	Remarks
Italy				Mar. 28-May 8, 1926: Cases, 3.
Palermo	Sept. 12-18	1		
Japan				Mar. 28-May 29, 1926: Cases, 37.
Latvia				May 1-June 30, 1926: Cases, 19. Aug. 1-31, 1926: Cases, 2.
Lithuania				Mar. 1-June 30, 1926: Cases, 190; deaths, 22. July 1-Aug. 31, 1926: Cases, 23.
Mexico				Feb. 1-June 30, 1926: Deaths, 189.
Durango	July 1-31		1	
Mexico City	May 16-June 5	20		Including municipalities in Federal District.
Do	June 13-19	9		Do.
Do	July 25-31	3		Do.
Do	Aug. 15-Dec. 4	99		Do.
San Luis Potosi	June 13-26			Present, city and country.
Morocco				Mar. 1-June 30, 1926: Cases, 426. July 1-Aug. 31, 1926: Cases, 20.
Norway:				
Stavanger	Sept. 6-12	1		
Palestine				Mar. 1-June 30, 1926: Cases, 14; deaths, 1. Aug. 1-Oct. 25, 1926: Cases, 22.
Birtuvia	Oct. 31-Nov. 6	1		
Gaza	July 6-12	1		
Haifa	July 13-Nov. 15	6		
Halalal	Aug. 17-23	1		
Jaffa district	June 15-28	5		
Do	Sept. 28-Nov. 8	4		
Jerusalem	Sept. 14-27	2		
Majdal district	July 13-Aug. 2	2		
Nazareth district	July 13-Nov. 8	7		
Petah Tokvah	Oct. 5-11	3		
Tiberias	Aug. 3-9	1		
Yavneil	Aug. 17-23	1		
Persia:				
Teheran	May 23-June 22		1	
Do	July 24-Sept. 23		5	
Peru:				
Arequipa	Jan. 1-31		2	
Lima	Aug. 1-31	1		
Poland				Mar. 28-June 26, 1926: Cases, 1,272; deaths, 85. June 27-Oct. 16, 1926: Cases, 346; deaths, 27.
Krakow	Oct. 17-23	31	5	
Tarnopol district	Oct. 10-16	1	1	
Rumania				Mar. 1-June 30, 1926: Cases, 899; deaths, 83. July 1-31, 1926: Cases, 65; deaths, 9.
Russia				Jan. 1-Apr. 30, 1926: Cases, 18,647.
Spain	Jan. 1-June 30		13	
Tunisia				Apr. 1-June 30, 1926: Cases, 110. July 1-Sept. 20, 1926: Cases, 101.
Tunis	June 11-30	3		
Turkey:				
Constantinople	June 16-22	1		
Union of South Africa				Apr. 1-May 31, 1926: Cases, 153; deaths, 19.
Do				July 1-31, 1926: Cases, 90; deaths, 17.
Cape Province				Apr. 1-June 30, 1926: Cases, 202; deaths, 24, native. July 1-Sept. 30, 1926: Cases, 82; deaths, 17.
Alexandria District	Oct. 31-Nov. 6			Outbreak in one locality.
Clydesdale	Oct. 17-23			Outbreaks.
Elliot District	Oct. 24-30	1		
Glengray district	June 27-July 3			Do.
Grahamstown	do	1		
Natal			1	Apr. 1-June 30, 1926: Cases, 28.
Durban	July 25-Sept. 18	11		July 1-31, 1926: Cases, 23; deaths, 2.
Orange Free State				Apr. 1-June 30, 1926: Cases, 24; deaths, 4. July 1-Sept. 30, 1926: Cases, 31.
Brandford district	Oct. 10-16			Outbreak on farm.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from June 26 to December 31, 1926—Continued

TYPHUS FEVER—Continued

Place	Date	Cases	Deaths	Remarks
Union of South Africa—Con.				
Transvaal				Apr. 1–June 30, 1926: Cases, 10; deaths, 5. July 1–31, 1926: Cases, 2. Aug. 15–21, 1926, outbreaks.
Johannesburg	Aug. 29–Sept. 4	1		Outbreaks.
Walkkerstrom district	June 20–26			Do.
Wolmaransstad district	do			Do.
Yugoslavia				Apr. 15–June 30, 1926: Cases, 48; deaths, 7. July 1–Oct. 31, 1926: Cases, 4; deaths, 1.
Zagreb	May 15–21	1		

YELLOW FEVER

Place	Date	Cases	Deaths	Remarks
Brazil	Reported June 26			Present in interior of Bahia, Pirapora, and Minas.
Bahia	May 9–June 26	10	7	
Do	July 4–10	1		
French Sudan:				
Segou	Nov. 23	1	1	
Gold Coast	Apr. 1–June 30	8	4	
Nigeria	June 1–30	1	1	
Senegal	Nov. 1–23		9	

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